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A Study of Attitudes, Competencies, and Understandings Achieved Through the Medium of Electronic Music in Selected Upper Elementary and Junior High School Classrooms

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A STUDY OF ATTITUDES, COMPETENCIES, AND UNDERSTANDINGS ACHIEVED THROUGH THE MEDIUM OF ELECTRONIC MUSIC IN SELECTED UPPER ELEMENTARY AND JUNIOR HIGH SCHOOL CLASSROOMS

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ABSTRACT

Problem

The purpose of this study was to test a basic ungraded program of study in electronic music suitable for use in grades five through eight.

Procedure

The research population consisted of 339 students drawn from two elementary schools and one junior high school in the Grand Forks, North Dakota, Public Schools. These students were grouped into seven pairs of experimental and control groups. For one semester the experimental groups received music instruction using an electronic music-based curriculum while the control groups received more general, traditional music instruction. Measurements were made with a battery of four pre/post-tests to determine any possible significant differences in attitude toward music, competencies in electronic music, and musical concept development that existed between the experimental and control groups.

The statistical techniques utilized for this study were analysis of covariance and analysis of variance by regression. Analysis of variance was included to identify any effects that could be attributed

to the covariate. The .05 level of confidence was established a priori for determining the significance of the analyses.

Findings

1. There were no significant differences between the control and experimental groups in attitude toward music.

2. In a majority of the groups tested, the experimental groups showed a significantly better mastery of competencies in electronic music than did the control groups.

3. Exposure to and involvement with electronic music contributed to a higher level of conceptual development for a majority of the experimental groups (for the portion of the musical concepts measured by the fourth test) than for the control groups.

4. Students' opinions of electronic music and their reactions to its inclusion in music class are much more positive in seventh and eighth grades than in fifth and sixth grades. There was a wide range of likes and dislikes; most students were able to tell quite specifically why they either liked or disliked electronic music. However, the comments seem to indicate that most students had not yet reached the point of being able to identify with the aesthetic aspects of electronic music.

Recommendations

1. Some electronic music should be introduced at each grade level with the main emphasis occurring at the seventh and eighth grades.

Becoming familiar with terms and techniques appears to be one of the greatest obstacles for students. A gradual acquisition of necessary knowledge and skills could be much more easily developed if electronic music were started in the lower grades.

2. The development of musical concepts (through exposure to and involvement with electronic music) that are applicable to many kinds of music has not been conclusively established by this study. Further study should be undertaken to identify these concepts. The need for a reliable test instrument is crucial.

3. Electronic music's many sound capabilities lend themselves to unlimited development of the creative capacity. Additional studies should be made to uncover the potential of electronic music in relation to research findings in other phases of creativity.

4. Electronic music study should last for a period of time that will enable students to master the mechanical aspects well enough for the aesthetic aspects of the music to become the central focus of the learning experience.

5. An electronic music-based class should be considered, on an elective basis, as an alternative to the traditional general music class in grades seven and eight. An additional study could be made to determine the differences between the electronic music-based class and the traditional general music class when self-selection (choice between electronic or traditional class) is made available to students.

CHAPTER I

INTRODUCTION

Although motivation has long been considered a crucial factor in creating an environment for learning, today's search for relevance in education points out a need for a very specific kind of motivation in the learning process--self-motivation.

Music is extremely personal; it can be viewed as a mirror of the changes in society and of culture in general. Learnings in music, because of its personal nature, must occur in an environment that is compatible with the personal needs of each student. Therefore, self-motivation must be nurtured through the kinds of musical experiences with which the learner can most easily and positively identify.

In choosing appropriate musical experiences, teachers at the upper elementary and junior high levels face an ever-increasing need to select experiences that will be meaningful for students and will reflect the cultural needs and aspirations of these young adults who want to be identified with the culture of today.

Although relevance and self-motivation are of prime importance, musical experiences need to be comprehensive enough to enable students to develop concepts about music that will be applicable to the wide range of existing musics.

Because electronic music involves a great deal of manipulative as well as creative activity and is a significant part of today's music, it possesses a high degree of motivational potential suitable for use with this age group, often characterized by an abundant amount of creative and physical energy.

It is the belief of this writer that the wide range of sound parameters and capabilities available in electronic music can provide the basis for the development of considerably more comprehensive musical concepts than could be developed through the use of any other single medium.

Need for the Study

A search for literature dealing with the use of electronic music in the classroom suggests a need for this study. The committee on Music in General Education of the Music Educators' National Conference, in 1965, strongly urged general music teachers to make use of today's music and to explore the scientific nature of sound. This same organization further extended the invitation to use electronic music in the classroom when it devoted the entire November, 1968, issue of the Music Educators Journal to the subject. The most recent editions of basic music textbook series published by Allyn and Bacon, American Book Company, Follett, Holt, Rinehart, and Winston, and Silver-Burdett have included in them brief units and listening lessons dealing with electronic music. A recent computer search made by the

RIC/ERIC CENTER at Chester Fritz Library in Grand Forks, North Dakota, and an extensive search of volumes of three of the most prominent music education research publications, Music Index, Council for Research in Music Education Bulletin, and Journal of Research in Music Education, have failed to reveal a single study pertaining specifically to the use and outcomes of electronic music-based instruction in the classroom.

The implementation of an electronic music-based approach to musical learning and growth is extremely dependent upon suitable material for use in the classroom. Hopefully, the study will provide the teacher with an indication of the kinds of learnings and attitudes that are possible to develop within the means of the average classroom environment.

Purpose of the Study

It is the primary purpose of this study to test a basic ungraded program of study in electronic music suitable for use in grades five through eight. The following null hypotheses are proposed to examine the effectiveness of this program:

1. There are no significant differences between control and experimental groups in their attitudes toward music, as measured by the pre and post-tests.

2. There are no significant differences between control and experimental groups in the mastery of competencies in electronic music, as measured by post-tests.

3. There are no significant differences between control and experimental groups in the extent to which musical concepts have been developed through exposure to and involvement with electronic music, as measured by post-tests.

Limitations of the Study

Because electronic music is so new in the classroom, existing test instruments appropriate to this study were unavailable. To test the previously stated null hypotheses, it was necessary to construct a series of tests that could be used to measure the several aspects of musical learning dealt with in this study.

A pilot study was administered on a pre-test basis to assure internal reliability of the test questions (Kuder-Richardson KR-20 and Cochran's Coefficient Alpha Tests of Reliability) on the main study. Sufficient reliability on the portions of the test requiring no specific knowledge of, or experience with, electronic music was obtained. However, some portions of the test were so foreign to the test subjects that an adequate measure of reliability was not possible. This difficulty did not recur to such a great extent in later testings because a considerably larger population was used.

In the main study, a higher degree of reliability was obtained, particularly when the instruments were used for the purpose of post-testing. Since the last two null hypotheses are concerned only with the measurement of a posteriori learning, the reliability obtained was deemed to be adequate.

Definition of Terms

Electronic Music: Music comprised of sounds that are either electronically produced or modified.

Electronic Music Packet: A packet of multi-media materials suitable for individual or classroom instruction in electronic music techniques.

Music Concept: A relatively complete and meaningful idea in the mind of a person about the structure and interrelatedness of the various elements of music.

Tape Recorder: A reel-to-reel tape recording machine of the type commonly found in most elementary and junior high schools.

Organization of the Study

The remainder of this study is organized as follows:

1. Chapter II contains a review of the related literature and a discussion of the use of electronic music in recent music textbook series.

2. Chapter III describes the population used for the study, the materials used in the classrooms, and the test instruments used. It also includes a discussion of the statistical treatment chosen for the analysis of the data obtained.

3. Chapter IV presents the data and its statistical analysis.

4. Chapter V summarizes the findings and presents conclusions and recommendations based upon these findings.

CHAPTER II

REVIEW OF RELATED LITERATURE

Because the existing reports of experimental programs in electronic music deal primarily with objectives and materials used, it is impossible to attempt to determine the effectiveness of any of these programs. The few schools in which initiative has been taken to utilize electronic music techniques in the classroom have been pioneers and, although they have not chosen to evaluate the effectiveness of their programs through research, it is assumed that the programs have met with some success since they have continued to exist after the initial pilot programs were completed.

Recommendations for Inclusion of Electronic Music in the Curriculum

The need for the inclusion of electronic music in the curriculum was first called to the attention of the profession by the Music Educators' National Conference (Ernst and Gary, 1965) when the following experiences were recommended for students in music classes:

1. The development of an awareness of the varied environmental and industrial sounds.

2. The knowledge of how sound is produced.

3. An understanding of the role of sound generators and the fundamental principles of sound generation, vibration, transmission, amplification, and timbre.

More definite direction was given by the same organization in 1968 when Hagemann (1968) and Modugno (1968) described pilot programs in operation at Julia R. Masterman School in Philadelphia, and Greenwich High School in Greenwich, Connecticut.

Early Electronic Music Programs

Two early projects that paved the way for the utilization of electronic music in the curriculum were Project PEP, described by Schmidt (1968) and the Greenwich Board of Education (1967), and the establishment of an electronic music laboratory for gifted children in Philadelphia by Hagemann (1968). The basic premise for the establishment of both programs was the elimination of the need for the elaborate traditional musical notation system which often serves as an obstacle to be overcome before the student can get to the music itself. Although both projects encouraged exploration and freedom, they also maintained a kind of comprehensive structure that would enable students to transfer, to other kinds of music, learnings in the realm of electronic music.

Even though no published research findings were available, the expansion of the project at Masterman School in Philadelphia and the continuation of electronic music classes in selected communities in Connecticut, after the initial pilot program funding had been discontinued, suggest that some literature may become available in the future.

Student Receptivity to Electronic Music

Prince (1972), in his review of a study by J. H. Butler, described the study as "the first to investigate musical taste in relation to electronic music." The prime motivation of Butler's study was to aid the music teacher in determining what percentage of a music appreciation course should be devoted to electronic music. The results of the study, as Prince points out, do not really contribute to the structuring of music appreciation course content, since the mean scores of subjects tested for receptivity to electronic music fall in the neutral area (approximately four) on a seven-point scale devised to show the "liking of" electronic music. However, the study is pertinent primarily because it appears to be the first available study of response to electronic music.

Electronic Music Usage in Current Music Textbooks

The most positive indication of interest in electronic music in the classroom lies in the inclusion, in the most recent editions of music textbooks, of units and listening lessons dealing with electronic music. An analysis of the latest editions of available music series, grades K-8, reveals that five of eight included material of the nature used in this study. The most extensive occurrence of such material was in the books designed for grades six, seven, and eight, although considerable material was also included in earlier grade levels. For a detailed analysis of the material found, see Appendix A.

CHAPTER III

DESIGN AND PROCEDURE

Population

The population chosen for this study was drawn from three Grand Forks, North Dakota, Public Schools: Belmont Elementary School, Twining Elementary School, and Valley Junior High School. These three schools were chosen because of their close proximity to the University of North Dakota and its electronic music studio, and because each of the music teachers at the three schools had expressed an interest in participating in the project.

In each school, classes were randomly paired into control and experimental groupings. The groups were tested for some degree of homogeneity by examining the mean intelligence test scores and the distribution of males and females in each group.

Seven paired groups were utilized in the study: one pair of mixed fifth and sixth grade classes at Belmont School, one pair each of fifth and sixth grade classes at Twining School and two pairs each of seventh and eighth grade classes at Valley Junior High School.

To test for possible sex distribution differences in the paired groups, a t-test for the significance of the difference between independent sample proportions was used (Koenker, 1971).

$$t = \frac{p_1 - p_2}{\sqrt{\dfrac{p_1 q_1}{N_1} + \dfrac{p_2 q_2}{N_2}}}$$

where p_1 = per cent of group one that possess some trait

q_1 = per cent of group one that does not possess the trait

p_2 = per cent of group two that possess some trait

q_2 = per cent of group two that does not possess the trait

N_1 = number of subjects in group one

N_2 = number of subjects in group two

No significant differences in the distribution of sex were found at the .05 level. (See Table 1 for more complete data.)

The mean intelligence scores for each of the paired groups were examined using the sum of squares method for computing t. The following equations were used (Roscoe, 1969):

$$SS = \Sigma w_i^2 - \frac{(\Sigma w_i)^2}{N}$$

$$S_{M_1-M_2} = \sqrt{\frac{SS_1 + SS_2}{N_1+N_2-2}\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}$$

$$t = \frac{M_1 - M_2}{S_{M_1-M_2}}$$

TABLE 1

T-TEST FOR SEX DISTRIBUTION DIFFERENCES

School and Grade	Group 1	Group 2	p_1(F)	q_1(M)	p_2(F)	q_2(M)	N_1	N_2	df	t	Significance of t
Belmont (grades 5,6)	Exper.	Control	.4500	.5500	.5000	.5000	20	20	38	-.32	$p > .05$
Twining (grade 5)	Exper.	Control	.5000	.5000	.6522	.3478	24	23	45	-1.07	$p > .05$
Twining (grade 6)	Exper.	Control	.4783	.5217	.5714	.4286	23	21	42	-.62	$p > .05$
Valley (grade 7, pair 1)	Exper.	Control	.5000	.5000	.5200	.4800	26	25	49	-.14	$p > .05$
Valley (grade 7, pair 2)	Exper.	Control	.5200	.4800	.5000	.5000	25	26	49	.14	$p > .05$
Valley (grade 8, pair 1)	Exper.	Control	.5000	.5000	.5385	.4615	26	26	50	-.28	$p > .05$
Valley (grade 8, pair 2)	Exper.	Control	.5556	.4444	.4815	.5185	27	27	52	.55	$p > .05$

Using tables for a two-tailed test, no significant differences were found between the mean intelligence test scores of the paired groups at the .05 level. (See Table 2.)

On the basis of these findings, the groups were judged to be suitable for use as matched experimental and control groups.

Materials Studied

Nine multi-media study packets were used as the basic material to be covered with the experimental group (Willman, 1972). The content of these packets includes reading material, experiments, listening examples, and compositional projects. The packets were designed to meet the educational objectives stated at the beginning of the set of materials. (For a list of these objectives, see Appendix B.)

The design of the material enabled the teachers to make initial group presentations followed by more individualized experiments and projects. Teachers were asked to cover as much of the material in the nine packets as they could in one semester (Spring Semester, 1972). Students in the seventh and eighth grades were able to complete all material up through and including packet number eight (packet nine is optional). The fifth and sixth grade subjects completed all packets up through number seven and were able to complete portions of packet number eight.

Sources of Data

Data were obtained from a battery of four tests (Test A, Test B, Test C, and Test D), designed for this study, and used for both pre and

TABLE 2

T-TEST FOR MEAN INTELLIGENCE TEST SCORE DIFFERENCES

School and Grade	Group 1	Group 2	M_1	M_2	N_1	N_2	SS_1	SS_2	$S_{M_1-M_2}$	df	t	Significance of t
Belmont (grades 5,6)	Exper.	Control	106.70	105.20	20	20	3260.20	3821.20	4.32	38	.35	$p > .05$
Twining (grade 5)	Exper.	Control	107.88	104.39	24	23	3999.67	3523.48	3.77	45	.93	$p > .05$
Twining (grade 6)	Exper.	Control	100.43	101.67	23	21	2889.65	3130.67	4.43	42	-.28	$p > .05$
Valley (grade 7, pair 1)	Exper.	Control	109.77	106.16	26	25	3504.62	6579.36	4.02	49	.90	$p > .05$
Valley (grade 7, pair 2)	Exper.	Control	104.84	105.89	25	26	2377.36	3614.65	3.10	49	-.32	$p > .05$
Valley (grade 8, pair 1)	Exper.	Control	107.39	108.73	26	26	7870.15	3509.12	4.18	50	-.32	$p > .05$
Valley (grade 8, pair 2)	Exper.	Control	105.22	106.19	27	27	4450.67	4816.07	3.63	52	-.27	$p > .05$

post-testing. Both experimental and control groups were tested with all four tests at the beginning of the semester and again at the end. All scoring was done by hand to eliminate possible confusion that might have resulted from the use of machine-scored answer sheets. In addition to these four tests, students in the experimental groups were asked to respond with their opinions of electronic music. These written comments were evaluated and they are discussed in chapter four. (See Appendix C.)

The Test Instrument

Learning outcomes were measured with a battery of four tests. (See Appendix D.) Test A evaluates, on a five-point Likert-type scale, attitudes toward music. The reported score is a mean of eighteen responses. Two questions each (one stated in positive terms and one in negative terms) are used to measure the following student characteristics:

1. Finds pleasure and satisfaction in music.

2. Values music as a means of self-expression.

3. Desires to continue musical experiences.

4. Responds aesthetically to music as a result of musical experiences and understandings.

5. Makes value judgments of aesthetic and expressive qualities of music.

6. Is able to verbalize reasons for liking or disliking music.

7. Has a positive outlook on the creative and performing value

of music.

8. Is aware of man's need for music in his life.

9. Rates music higher, in relation to other subjects, than before.

Test B also makes use of a Likert-type scale. The scalar responses represent each subject's personal assessment of his own competency to operate equipment and compose music. Each test question contains a list of five skills that are to be evaluated, thus the range of the scale is from 0 to 5 (5 being the highest).

A mean score, based this time upon 13 groups of skills, represents the student's ability to perform these skills. The competencies included in these thirteen groups are the ability to:

1. Operate a reel-to-reel tape recorder well enough to prepare musique concrète and electronic music tape recordings.

2. Mape tape splices.

3. Make and use tape loops.

4. Transfer sounds directly from one recorder or sound source to another, and to execute speed changes.

5. Operate simple electronic tone generators, reverberation units, and filters, and to correctly patch them into an amplifier or tape recorder.

6. Produce sound on conventional instruments in new ways.

7. Produce sounds on unconventional instruments.

8. Transform the character of conventional instruments.

9. Treat instrumental sounds electronically.

10. Treat industrial sounds and noises electronically.

11. Devise one's own system or systems of notation which will serve as a plan for creating compositions.

12. Interpret various kinds of notational systems used by other composers.

13. Express oneself through original music composition using understandings of the elements of music as a basis for creating the composition.

Test C evaluates the subject's ability to identify selected music concepts through listening. Twenty-six recorded musical examples are played and multiple-choice responses are provided to enable the subject to record his awareness of the concepts as expressed below (Willman, 1972):

1. Timbre is the tone color or quality of a given sound.

2. Expressiveness may be the result of timbral choice.

3. Like timbres are said to blend.

4. Unlike timbres provide contrast.

5. New (composite) timbres are formed when timbres are combined.

6. Timbres may be changed through modification of the harmonic structure.

7. Penetrating timbres achieve the best linear clarity when combined with more subdued timbres.

8. Pointillism may be used to provide interest within a given timbre.

9. Vibrato is a slight recurring fluctuation in frequency (pitch).

10. Tremolo is the rapid interruption of a sound or timbre.

11. The timbre of conventional instruments is changed as the method of playing changes.

12. The degree of loudness or softness of a sound will affect its expressive quality.

13. Different degrees of loudness and softness may be attained gradually or abruptly.

14. Dynamics may be used to shape a given phrase or musical thought by placing a climax in a strategic position.

15. The dynamics involved in the attack and decay (and the sustaining) of a sound comprise its sound envelope.

16. Sounds which are emphasized more than others are said to be accented.

17. Rhythm is the resulting effect produced when sounds and silences of similar or varying duration are combined.

18. The speed with which the music appears to move is called its tempo.

19. Rhythm may undergo augmentation when the durations of the component parts of a musical thought are proportionally compressed.

20. A gradual tempo increase is called an accelerando.

21. A gradual tempo decrease is called a ritardando.

22. Sounds that can be identified and/or reproduced by another sound source have definite pitch.

23. All sounds that cannot be identified and/or reproduced by another sound source have indefinite pitch.

24. Pitch may be selected systematically or randomly.

25. A linear grouping of pitches is called melody.

26. A horizontal grouping of pitches is called harmony.

27. Harmony is the result of the production of several (one or more) pitches simultaneously.

28. Chords, or sound clusters, may result from the simultaneous sounding of one or more pitches as a unit or as a result of their combination as independent musical thoughts.

29. Two or more melodies heard simultaneously create a kind of harmony known as polyphony.

30. Two or more pitches moving rhythmically together create monophony or chordal harmony.

31. One organizational system of combining pitches to create a melody is called a tone row.

Test D evaluates the subject's familiarity with electronic music terms. Forty-six terms are arranged in six groups to be matched with corresponding definitions. The terms used are:

amplifier
amplitude
attack
audio generator
audio oscillator
contact microphone
decay
envelope
erase head
feedback
filter
four-track recording
frequency
gain
half-track recording
harmonic
hertz

parameter
patch cord
plug
potentiometer
prepared piano
pulse wave
recording head
reverberation
ring modulator
sawtooth wave
signal generator
sine wave
sound-on-sound
source
splice
square wave
synthesizer

input
jack
magnetic tape
mixer
musique concrète
output
timbre
transistor
triangle wave
waveform
white noise

Pilot Study

A pilot study was undertaken to establish reliability for the four tests. Random samples were drawn from three general music classes: a sixth grade class in Finley, North Dakota (23 students), and a sixth grade class (32 students) and a seventh grade class (27 students) in Red Lake Falls, Minnesota (St. Joseph Elementary School).

Internal reliability was computed using the Kuder-Richardson KR-20 equation. A more generalized form of this same equation, developed by Cronbach (Magnusson, 1967), was used to compute Coefficient Alpha, a reliability coefficient for summated rating-type tests. Reliability for Test A was established at .6852; Test B was left totally blank by so many students that the reliability coefficient was not computed. Test C yielded a coefficient of .3815, and for Test D, it was .8719.

The reliability of Tests A and D were considered to be within the acceptable limits for group testing. Since no measure for Test B was available, and the reliability of test C was quite low, a review was made of the factors affecting reliability. Whybrew (1971) reports that low reliability is often attributable to any one, or a combination of these factors: short tests, a small number of test subjects, and a limited choice of options in multiple-choice tests.

Because the main study included more subjects than did the pilot study, it was felt that reliability coefficients on the subsequent use of the tests would prove to be higher. Therefore, it was decided to proceed with the main study in spite of somewhat low reliability obtained for the pilot study.

Reliability of the Test Instrument

The reliability of the pre and post-tests bears out this judgment, except for Test C. It may be seen from Table 3 that the reliability of the total group tends to be greater than that of many of the individual small groups. The entire population (N=399) yielded reliability coefficients of .7731 for Pre-test A, .7464 for Post-test A, .6137 for Pre-test B, .8473 for Post-test B, .3456 for Pre-test C, .3752 for Post-test C, .8616 for Pre-test D, and .9585 for Post-test D. Reliability is shown separately in Table 3 for each experimental and control group.

Statistical Treatment

The null hypotheses stated in chapter one were tested by treating the pre and post-test scores with multiple linear regression techniques.

Analysis of covariance was used to determine existing differences (if any) between control and experimental groups on each of the four parts of the test. Each pair of groups was treated four times (once for each of the four tests), using the post-test scores of each test as a criterion variable, and the pre-test scores and group membership (experimental or control group) as predictors.

TABLE 3

RELIABILITY OF TESTS A, B, C, AND D

School and Grade	Group	Pre-A	Post-A	Pre-B	Post-B	Pre-C	Post-C	Pre-D	Post-D	N
Belmont (grades 5,6)	Experimental	.7912	.6634	.6777	.8267	.4738	.6704	.7344	.9088	20
	Control	.7368	.7136	.5298	.8327	.2573	.0829	.8149	.9305	20
Twining (grade 5)	Experimental	.7759	.7563	.5967	.8395	.2584	.5538	.6754	.8364	24
	Control	.7084	.7323	.6373	.8082	-.0155	.3312	.7562	.3310	23
Twining (grade 6)	Experimental	.7002	.6175	.5914	.8852	.4313	-.1186	.8015	.8896	23
	Control	.7585	.6538	.5930	.8273	.5958	.0961	.7678	.5963	21
Valley (grade 7, pair 1)	Experimental	.6192	.7944	.7257	.7871	.0819	-.0812	.8222	.7362	26
	Control	.6977	.6413	.6509	.6861	-.1623	-.0801	.8906	.8296	25
Valley (grade 7, pair 2)	Experimental	.5642	.5995	.6705	.7487	.1881	.3968	.8440	.8704	25
	Control	.6787	.7682	.7606	.7844	.2935	-.0517	.08494	.7817	26

TABLE 3--Continued

School and Grade	Group	Pre-A	Post-A	Pre-B	Post-B	Pre-C	Post-C	Pre-D	Post-D	N
Valley (grade 8, pair 1)	Experimental	.6977	.5672	.7438	.8120	.3512	-.0514	.8974	.8765	26
	Control	.7371	.7671	.6935	.7573	.0186	.2649	.7917	.9047	26
Valley (grade 8, pair 2)	Experimental	.8008	.7600	.6849	.8093	.6117	.6259	.8590	.8789	27
	Control	.7149	.7047	.6342	.7584	-.0138	.2571	.8335	.8335	27
Total Population		.7731	.7464	.6137	.8473	.3456	.3742	.8616	.9585	339

Analysis of variance was used, as a second method, to determine any differences in pre-test and post-test scores of the experimental and control groups.

Adjusted means are reported for the post-test scores for both the experimental and control groups. These means are used to compare differences that exist between experimental and control groups when the value of F is significant as a result of either analysis of covariance or analysis of variance. A level of .05 was set a priori as a standard for determining significance.

CHAPTER IV

ANALYSIS OF THE DATA

The data collected from the research population described in chapter three are presented in the sections that follow. From the analysis of these data, evidence will be produced to either support or reject the null hypotheses stated in chapter one.

This chapter consists of five sections; the first four contain a report of the data, and analyses of the data from Tests A, B, C, and D. The fifth section is a brief discussion of experimental group students' comments describing their reactions to electronic music.

In treating the test scores, both analysis of covariance (ANCOV) and analysis of variance (ANOVA) were used. Both are reported so that readers interested in the effect of the covariate may compare the difference in F values resulting from the two different types of analysis. In addition, adjusted means are given, so the reader may easily determine which group (experimental or control) mean is the larger when a significant value of F is reported.

The adjusted means were found using the following equation:

$$\overline{Y}_k(\text{adj.}) = \overline{Y}_k - b_o(\overline{X}_k - \overline{X}_T)$$

where $\overline{Y}_k$ (adj.) = the adjusted mean of the post-test (for the experimental or control group)

b_o = the regression coefficient from the analysis of covariance

$\overline{Y}_k$ = the mean of the pre-test (for the experimental or control group)

$\overline{X}_T$ = the mean of the pre-test for the pair (experimental and control group)

The regression approach used in this study, including the adjustment procedure, is described in detail, with examples, by Williams (1971). Readers not familiar with this approach are encouraged to examine Williams' explanation to gain a more thorough understanding of the techniques used.

Mean scores for each pair of groups and the total population are given in Tables 4, 5, 6, and 7. The data reported in these tables are used in the adjustment process, the analysis of covariance, and the analysis of variance.

Test A scores represent, on a five point Likert-type scale, attitudes toward music. The reported score is a mean of eighteen responses (with a range from 1 to 5). The scores reported for Test B also represent scalar responses. The scores are means of thirteen responses that assess competency in the operation of equipment and music composition. (The range is from 0 to 5.) Five is the highest possible mean for both Test A and for Test B. The scores for Test C indicate the number of correct responses on a listening test which measures musical concept development. There is a possible score of 26. Test D scores represent the number of correct responses on a series of matching questions. There is a total of 46 electronic music terms to be matched.

The null hypothesis tested by Test A states that there are no significant differences between control and experimental groups in their attitudes toward music, as measured by the pre and post-tests. Both an analysis of covariance and an analysis of variance were used to make a comparison of the experimental and control groups' attitudes toward music.

Each of the resulting F values was then compared to the F values required for significance at the .05 level. Table 8 gives the required values of F for significance at the .05 level with the corresponding degrees of freedom for each of the seven pairs of population groups and the total population. This table should be referred to for all subsequent comparisons of F values.

TABLE 4

MEAN SCORES, TEST A

School and grade	Group	Pre-test	Post-test	N
Belmont (grades 5,6)	Experimental	3.78	3.58	20
	Control	3.80	3.77	20
	Composite	3.79	3.68	40
Twining (grade 5)	Experimental	3.97	3.84	24
	Control	3.99	3.80	23
	Composite	3.98	3.82	47
Twining (grade 6)	Experimental	3.85	3.87	23
	Control	3.52	3.56	21
	Composite	3.69	3.72	44
Valley (grade 7, pair 1)	Experimental	3.60	3.56	26
	Control	3.52	3.58	25
	Composite	3.56	3.57	51
Valley (grade 7, pair 2	Experimental	3.57	3.56	25
	Control	3.70	3.62	26
	Composite	3.64	3.59	51
Valley (grade 8, pair 1)	Experimental	3.54	3.69	26
	Control	3.51	3.54	26
	Composite	3.53	3.62	52
Valley (grade 8, pair 2)	Experimental	3.69	3.73	27
	Control	3.49	3.47	27
	Composite	3.59	3.60	54
Total Population	Experimental	3.71	3.69	171
	Control	3.64	3.61	168
	Composite	3.67	3.65	339

TABLE 5

MEAN SCORES, TEST B

School and grade	Group	Pre-test	Post-test	N
Belmont	Experimental	1.19	2.44	20
(grades 5,6)	Control	1.43	0.84	20
	Composite	1.31	1.64	40
Twining	Experimental	0.28	1.96	24
(grade 5)	Control	0.48	0.83	23
	Composite	0.38	1.41	47
Twining	Experimental	0.44	2.24	23
(grade 6)	Control	0.96	1.53	21
	Composite	0.69	1.90	44
Valley	Experimental	1.85	3.84	26
(grade 7,	Control	1.01	2.21	25
pair 1)	Composite	1.44	3.04	51
Valley	Experimental	1.30	3.28	25
(grade 7,	Control	1.17	2.68	26
pair 2)	Composite	1.23	2.97	51
Valley	Experimental	1.75	3.57	26
(grade 8,	Control	1.82	2.69	26
pair 1)	Composite	1.79	3.13	52
Valley	Experimental	1.58	3.45	27
(grade 8,	Control	1.66	2.49	27
pair 2)	Composite	1.62	2.97	54
Total Population	Experimental	1.22	3.01	171
	Control	1.24	1.97	168
	Composite	1.23	2.49	339

TABLE 6

MEAN SCORES, TEST C

School and grade	Group	Pre-test	Post-test	N
Belmont (grades 5,6)	Experimental	18.90	17.80	20
	Control	16.85	18.00	20
	Composite	17.88	17.90	40
Twining (grade 5)	Experimental	16.92	18.29	24
	Control	17.52	16.61	23
	Composite	17.21	17.47	47
Twining (grade 6)	Experimental	17.00	17.44	23
	Control	15.76	15.81	21
	Composite	16.41	16.66	44
Valley (grade 7, pair 1)	Experimental	18.08	17.89	26
	Control	17.32	18.08	25
	Composite	17.71	17.98	51
Valley (grade 7, pair 2)	Experimental	18.68	17.88	25
	Control	18.27	18.50	26
	Composite	18.47	18.20	51
Valley (grade 8, pair 1)	Experimental	18.15	18.39	26
	Control	18.15	18.62	26
	Composite	18.15	18.51	52
Valley (grade 8, pair 2)	Experimental	18.41	19.11	27
	Control	17.59	18.37	27
	Composite	18.00	18.74	54
Total Population	Experimental	18.02	18.14	171
	Control	17.42	17.78	168
	Composite	17.72	17.96	339

TABLE 7

MEAN SCORES, TEST D

School and grade	Group	Pre-test	Post-test	N
Belmont (grade 5,6)	Experimental	10.00	24.40	20
	Control	9.40	21.55	20
	Composite	9.70	22.98	40
Twining (grade 5)	Experimental	11.29	22.88	24
	Control	8.26	18.83	23
	Composite	9.81	20.90	47
Twining (grade 6)	Experimental	11.44	22.44	23
	Control	8.00	18.71	21
	Composite	9.80	20.66	44
Valley (grade 7, pair 1)	Experimental	16.69	33.00	26
	Control	17.52	27.20	25
	Composite	17.10	30.16	51
Valley (grade 7, pair 2)	Experimental	16.12	31.80	25
	Control	16.81	26.31	26
	Composite	16.47	29.00	51
Valley (grade 8, pair 1)	Experimental	19.73	34.62	26
	Control	19.19	27.39	26
	Composite	19.46	31.01	52
Valley (grade 8, pair 2)	Experimental	18.78	35.00	27
	Control	18.15	28.63	27
	Composite	18.47	31.82	54
Total Population	Experimental	15.15	29.54	171
	Control	14.35	24.44	168
	Composite	14.75	27.01	339

TABLE 8

DEGREES OF FREEDOM AND F VALUES REQUIRED FOR SIGNIFICANCE AT THE .05 LEVEL FOR TESTS A, B, C, AND D

School and grade	df (for variation attributable to regression)	df (for variation attributable to deviation from regression)	df (required for significance at the .05 level)
Belmont	1	37	4.11
(grades 5,6)	1	38	4.10
Twining	1	44	4.06
(grade 5)	1	45	4.06
Twining	1	41	4.08
(grade 6)	1	42	4.07
Valley	1	48	4.04
(grade 7, pair 1)	1	49	4.04
Valley	1	48	4.04
(grade 7, pair 2)	1	49	4.04
Valley	1	49	4.04
(grade 8, pair 1)	1	50	4.03
Valley	1	51	4.03
(grade 8, pair 2)	1	52	4.03
Total Population	1	336	3.87
	1	337	3.87

Tables 9, 10, 11 summarize the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test A for Belmont School, grades five and six.

TABLE 9

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT BELMONT SCHOOL, GRADES FIVE AND SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	.34	.34	3.15
Deviation from regression	37	3.99	.11	
Total	38	4.33		

TABLE 10

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT BELMONT SCHOOL, GRADES FIVE AND SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	.37	.37	2.20
Deviation from regression	38	6.40	.17	
Total	39	6.77		

TABLE 11

ADJUSTED MEANS FOR POST-TEST A,
BELMONT SCHOOL, GRADES FIVE AND SIX

Experimental group	Control group
3.59	3.76

There was no significance at the .05 level shown in the above table.

Tables 12, 13, and 14 are summary tables of the anlysis of co-variance, anlaysis of variance, and adjusted means for pre and post-test scores on Test A for Twining School, grade five.

TABLE 12

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST
SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL
GROUPS AT TWINING SCHOOL, GRADE FIVE

Source of Variation	df	SS	MS	F
Attributable to regression	1	.04	.04	.31
Deviation from regression	44	5.60	.13	
Total	45	5.64		

TABLE 13

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT TWINING SCHOOL, GRADE FIVE

Source of Variation	df	SS	MS	F
Attributable to regression	1	.02	.02	.09
Deviation from regression	45	10.18	.23	
Total	46	10.20		

TABLE 14

ADJUSTED MEANS FOR POST-TEST A, TWINING SCHOOL, GRADE FIVE

Experimental group	Control group
3.85	3.79

No significance was found for F at the .05 level.

Analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test A for Twining School, grade six, are given in Tables 15, 16, and 17.

TABLE 15

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT TWINING SCHOOL, GRADE SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	.30	.30	2.31
Deviation from regression	41	5.17	.13	
Total	42	5.47		

TABLE 16

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT TWINING SCHOOL, GRADE SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	1.05	1.05	6.51*
Deviation from regression	42	6.78	.16	
Total	43	7.83		

*Significance with $p < .01$

TABLE 17

ADJUSTED MEANS FOR POST-TEST A, TWINING SCHOOL, GRADE SIX

Experimental group	Control group
3.81	3.63

The value of F found in the analysis of variance is significant at the .05 level. The significantly higher mean is that of the experimental group.

A summary of analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test A for Valley Junior High School, grade seven, pair one, will be presented in Tables 18, 19, and 20.

TABLE 18

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	.06	.06	.40
Deviation from regression	48	7.36	.15	
Total	49	7.42		

TABLE 19

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	.01	.01	.03
Deviation from regression	49	10.12	.21	
Total	50	10.13		

TABLE 20

ADJUSTED MEANS FOR POST-TEST A, VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR ONE

Experimental group	Control group
3.54	3.58

No significance was found, at the .05 level, for the above values of F.

Tables 21, 22, and 23 give a summary of the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test A for Valley Junior High School, grade seven, pair two.

TABLE 21

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	.01	.01	.1
Deviation from regression	48	4.98	.10	
Total	49	4.99		

TABLE 22

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	.06	.06	.33
Deviation from regression	49	8.62	.18	
Total	50	8.68		

TABLE 23

ADJUSTED MEANS FOR POST-TEST A, VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR TWO

Experimental group	Control group
3.61	3.57

F was not significant at the .05 level.

Analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test A for Valley Junior High School, grade eight, pair one, are given in Tables 24, 25, and 26.

TABLE 24

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	.22	.22	1.69
Deviation from regression	49	6.49	.13	
Total	50	6.71		

TABLE 25

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	.28	.28	1.40
Deviation from regression	50	9.99	.20	
Total	51	10.27		

TABLE 26

ADJUSTED MEANS FOR POST-TEST A, VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR ONE

Experimental group	Control group
3.68	3.56

No significance at the .05 level was found.

Tables 27, 28, and 29 summarize the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test A for Valley Junior High School, grade eight, pair two.

TABLE 27

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	.35	.35	2.69
Deviation from regression	51	6.83	.13	
Total	52	7.18		

TABLE 28

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	.95	.95	4.91
Deviation from regression	52	10.05	.19	
Total	53	11.00		

TABLE 29

ADJUSTED MEANS FOR POST-TEST A, VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR TWO

Experimental group	Control group
3.68	3.52

F was found to be significant at the .05 level in the analysis of variance. The mean of the experimental group was the greater of the two means.

Tables 30, 31, and 32 summarize the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test A for experimental and control groups, total research population, grades five, six, seven, and eight.

TABLE 30

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS, TOTAL RESEARCH POPULATION, GRADES FIVE, SIX, SEVEN, AND EIGHT

Source of Variation	df	SS	MS	F
Attributable to regression	1	.13	.13	1.00
Deviation from regression	336	42.59	.13	
Total	337	42.72		

TABLE 31

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST A FOR EXPERIMENTAL AND CONTROL GROUPS, TOTAL RESEARCH POPULATION, GRADES FIVE, SIX, SEVEN, AND EIGHT

Source of Variation	df	SS	MS	F
Attributable to regression	1	.49	.49	2.46
Deviation from regression	337	66.80	.20	
Total	338	67.29		

TABLE 32

ADJUSTED MEANS FOR POST-TEST A, TOTAL RESEARCH POPULATION, GRADES FIVE, SIX, SEVEN, AND EIGHT

Experimental group	Control group
3.67	3.63

No significance was found for F at the .05 level.

The only significant differences found at the .05 level between the control and experimental groups were in the sixth grade at Twining School and pair two of the eighth grade at Valley Junior High School. This difference was significant only for the analysis of variance. Treating the same data with analysis of covariance did not yield any significance at the .05 level. Because no other significant differences at the .05 level were found in the tables for Test A, the null hypothesis must be retained.

Test B

The second null hypothesis stated in chapter one is that there are no significant differences between control and experimental groups in the mastery of competencies in electronic music, as measured by post-tests. This hypothesis was tested using Test B. As with the previous null hypothesis, both analysis of covariance and analysis of variance were used to test for significant differences at the .05 level between the experimental and control groups in each pair.

Tables 33, 34, and 35 summarize the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test B for Belmont School, grades five and six.

TABLE 33

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT BELMONT SCHOOL, GRADES FIVE AND SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	23.92	23.92	21.75*
Deviation from regression	37	40.63	1.10	
Total	38	64.55		

*Significance with $p < .01$

TABLE 34

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT BELMONT SCHOOL, GRADES FIVE AND SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	25.73	25.73	24.05*
Deviation from regression	38	40.65	1.07	
Total	39	66.38		

*Significance with $p < .01$

TABLE 35

ADJUSTED MEANS FOR POST-TEST B, BELMONT SCHOOL, GRADES FIVE AND SIX

Experimental group	Control group
2.38	.90

Significance was found for F at the .05 level in both the analysis of covariance and the analysis of variance. The mean of the experimental group is significantly higher than that of the control group.

Tables 36, 37, and 38 are summary tables of the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test B for Twining School, grade five.

TABLE 36

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES
ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS
AT TWINING SCHOOL, GRADE FIVE

Source of Variation	df	SS	MS	F
Attributable to regression	1	18.34	18.34	18.71*
Deviation from regression	44	43.32	.98	
Total	45	61.66		

*Significance with $p < .01$

TABLE 37

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES
ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS
AT TWINING SCHOOL, GRADE FIVE

Source of Variation	df	SS	MS	F
Attributable to regression	1	14.88	14.88	13.93*
Deviation from regression	45	48.05	1.07	
Total	46	62.93		

*Significance with $p < .01$

TABLE 38

ADJUSTED MEANS FOR POST-TEST B,
TWINING SCHOOL, GRADE FIVE

Experimental group	Control group
2.05	.74

The values of F found in both the analysis of covariance and the analysis of variance are significant at the .05 level. The significantly higher mean is that of the experimental group.

Analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test B for Twining School, grade six, are given in Tables 39, 40, and 41.

TABLE 39

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES
ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS
AT TWINING SCHOOL, GRADE SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	12.65	12.65	6.73
Deviation from regression	41	76.97	1.88	
Total	42	89.62		

TABLE 40

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT TWINING SCHOOL, GRADE SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	5.41	5.41	2.60
Deviation from regression	42	87.53	2.08	
Total	43	92.94		

TABLE 41

ADJUSTED MEANS FOR POST-TEST B, TWINING SCHOOL, GRADE SIX

Experimental group	Control group
2.51	1.24

The value of F found in the analysis of covariance is significant at the .05 level. The significantly higher mean is that of the experimental group.

A summary of analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test B for Valley Junior High School, grade seven, pair one, will be presented in Tables 42, 43, and 44.

TABLE 42

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	12.70	12.70	27.02*
Deviation from regression	48	22.66	0.47	
Total	49	35.36		

*Significance with $p < .01$

TABLE 43

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	34.17	34.17	64.33*
Deviation from regression	49	26.03	.53	
Total	50	60.20		

*Significance with $p < .01$

TABLE 44

ADJUSTED MEANS FOR POST-TEST B, VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR ONE

Experimental group	Control group
3.82	2.23

F was found to be significant at the .05 level in both the analysis of covariance and the analysis of variance. The mean of the experimental group was the greater of the two means.

Tables 45, 46, and 47 give a summary of the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test B for Valley Junior High School, grade seven, pair two.

TABLE 45

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	3.78	3.78	5.48
Deviation from regression	48	33.08	.69	
Total	49	36.86		

TABLE 46

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	4.68	4.68	6.34
Deviation from regression	49	36.16	.74	
Total	50	40.84		

TABLE 47

ADJUSTED MEANS FOR POST-TEST B, VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR TWO

Experimental group	Control group
3.25	2.71

The value of F found in both the analysis of covariance and the analysis of variance are significant at the .05 level. The experimental group mean is the greater of the two means.

Analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test B for Valley Junior High School, grade eight, pair one, are given in Tables 48, 49, and 50.

TABLE 48

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	11.33	11.33	18.27*
Deviation from regression	49	30.45	.62	
Total	50	41.78		

*Significance with $p < .01$

TABLE 49

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	9.94	9.94	10.94*
Deviation from regression	50	45.41	.91	
Total	51	55.35		

*Significance with $p < .01$

TABLE 50

ADJUSTED MEANS FOR POST-TEST B, VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR ONE

Experimental group	Control group
3.60	2.66

F was found to be significant at the .05 level in both the analysis of covariance and the analysis of variance. The mean of the experimental group was the greater of the two means.

Tables 51, 52, and 53 summarize the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test B for Valley Junior High School, grade eight, pair two.

TABLE 51

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	14.16	14.16	25.75*
Deviation from regression	51	27.91	.55	
Total	52	42.07		

*Significance with $p < .01$

TABLE 52

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	12.31	12.31	15.61*
Deviation from regression	52	40.99	.79	
Total	53	53.30		

*Significance with $p < .01$

TABLE 53

ADJUSTED MEANS FOR POST-TEST B, VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR TWO

Experimental group	Control group
3.49	2.45

The values of F found in both the analysis of covariance and the analysis of variance are significant at the .05 level. The significantly higher mean is that of the experimental group.

Tables 54, 55, and 56 summarize the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test B for experimental and control groups, total research population, grades five, six, seven, and eight.

TABLE 54

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS, TOTAL RESEARCH POPULATION, GRADES FIVE, SIX, SEVEN, AND EIGHT

Source of Variation	df	SS	MS	F
Attributable to regression	1	93.40	93.40	86.48*
Deviation from regression	336	362.51	1.08	
Total	337	455.91		

*Significance with $p < .01$

TABLE 55

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST B FOR EXPERIMENTAL AND CONTROL GROUPS, TOTAL RESEARCH POPULATION, GRADES FIVE, SIX, SEVEN, AND EIGHT

Source of Variation	df	SS	MS	F
Attributable to regression	1	92.87	92.87	62.65*
Deviation from regression	337	499.53	1.48	
Total	338	592.40		

*Significance with $p < .01$

TABLE 56

ADJUSTED MEANS FOR POST-TEST B, TOTAL RESEARCH POPULATION, GRADES FIVE, SIX, SEVEN, AND EIGHT

Experimental group	Control group
3.02	1.96

F was found to be significant at the .05 level in both the analysis of covariance and the analysis of variance. The mean of the experimental group was the larger of the two means.

Significant differences at the .05 level were found between the experimental and control groups in each of the seven pairs and in the total population using analysis of covariance. In all schools except Twining, grade six, significance was found using analysis of variance using analysis of variance for the total population significance was also found. In each pair, the adjusted mean of the post-test score was greater for the experimental group than for the control group. Thus, the hypothesis must be rejected and the significant differences attributed to the larger post-test mean of the experimental group.

Test C

Because a satisfactory level of reliability was not obtained for Test C, the analysis of covariance and analysis of variance are not reported. The third null nypothesis was to have been tested using both Tests C and D. Since Test C was not reliable for the population being measured, Test D was used as the sole measure of significant differences to test this hypothesis.

Test D

The third hypothesis, which is tested by Test D, states that there are no significant differences between control and experimental groups in the extent to which musical concepts have been developed through exposure to and involvement with electronic music, as measured by post-tests.

The values for F resulting from the analysis of covariance and the analysis of variance are given, for each of the seven groups, in the tables that follow.

Tables 57, 58, and 59 summarize the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test D for Belmont School, grades five and six.

TABLE 57

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT BELMONT SCHOOL, GRADES FIVE AND SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	56.80	56.80	2.62
Deviation from regression	37	308.49	21.72	
Total	38	860.29		

TABLE 58

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT BELMONT SCHOOL, GRADES FIVE AND SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	81.22	81.22	1.92
Deviation from regression	38	1609.75	42.36	
Total	39	1690.97		

TABLE 59

ADJUSTED MEANS FOR POST-TEST D, BELMONT SCHOOL, GRADES FIVE AND SIX

Experimental group	Control group
24.17	21.78

No significance at the .05 level was found.

Tables 60, 61, and 62 are summary tables of the analysis of co-variance, analysis of variance, and adjusted means for pre and post-test scores on Test D for Twining School, grade five.

TABLE 60

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES
ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS
AT TWINING SCHOOL, GRADE FIVE

Source of Variation	df	SS	MS	F
Attributable to regression	1	97.63	97.63	11.27*
Deviation from regression	44	381.24	8.66	
Total	45	478.78		

*Significance with $p < .01$

TABLE 61

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES
ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS
AT TWINING SCHOOL, GRADE FIVE

Source of Variation	df	SS	MS	F
Attributable to regression	1	192.54	192.54	15.36*
Deviation from regression	45	563.93	12.53	
Total	46	756.47		

*Significance with $p < .01$

TABLE 62

ADJUSTED MEANS FOR POST-TEST D, TWINING SCHOOL, GRADE FIVE

Experimental group	Control group
22.36	19.37

The values of F found in both the analysis of covariance and the analysis of variance are significant at the .05 level. The significantly higher mean is that of the experimental group.

Analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test D for Twining School, grade six, are given in Tables 63, 64, and 65.

TABLE 63

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT TWINING SCHOOL, GRADE SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	50.11	50.11	5.13
Deviation from regression	41	400.07	9.76	
Total	42	450.18		

TABLE 64

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT TWINING SCHOOL, GRADE SIX

Source of Variation	df	SS	MS	F
Attributable to regression	1	151.95	151.95	8.62*
Deviation from regression	42	739.93	17.62	
Total	43	891.88		

*Significance with $p < .01$

TABLE 65

ADJUSTED MEANS FOR POST-TEST D, TWINING SCHOOL, GRADE SIX

Experimental group	Control group
21.72	19.50

The values of F found in the analysis of covariance and the analysis of variance are significant at the .05 level. The mean of the experimental group is significantly larger than that of the control group.

A summary of analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test D for Valley Junior High School, grade seven, pair one, will be presented in

Tables 66, 67, and 68.

TABLE 66

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	476.09	476.09	33.98*
Deviation from regression	48	672.58	14.01	
Total	49	1148.67		

*Significance with $p < .01$

TABLE 67

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	428.75	428.75	16.09*
Deviation from regression	49	1306.00	26.65	
Total	50	1734.75		

*Significance with $p < .01$

TABLE 68

ADJUSTED MEANS FOR POST-TEST D, VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR ONE

Experimental group	Control group
33.16	27.04

F was found to be significant at the .05 level in both the analysis of covariance and the analysis of variance. The mean of the experimental group was the greater of the two means.

Tables 69, 70, and 71 give a summary of the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test D for Valley Junior High School, grade seven, pair two.

TABLE 69

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	431.53	451.53	29.80*
Deviation from regression	48	695.15	14.48	
Total	49	1126.68		

*Significance with $p < .01$

TABLE 70

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	384.46	384.46	13.14*
Deviation from regression	49	1433.54	29.26	
Total	50	1818.00		

*Significance with $p < .01$

TABLE 71

ADJUSTED MEANS FOR POST-TEST D, VALLEY JUNIOR HIGH SCHOOL, GRADE SEVEN, PAIR TWO

Experimental group	Control group
31.97	26.15

The values of F found in both the analysis of covariance and the analysis of variance are significant at the .05 level. The experimental group mean is the greater of the two means.

Analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test D for Valley Junior High School, grade eight, pair one, are given in Tables 72, 73, and 74.

TABLE 72

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	639.80	639.80	19.76*
Deviation from regression	49	1586.59	32.38	
Total	50	2226.39		

*Significance with $p < .01$

TABLE 73

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR ONE

Source of Variation	df	SS	MS	F
Attributable to regression	1	679.69	679.69	15.28*
Deviation from regression	50	2224.30	44.49	
Total	51	2903.99		

*Significance with $p < .01$

TABLE 74

ADJUSTED MEANS FOR POST-TEST D, VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR ONE

Experimental group	Control group
34.51	27.50

F was found to be significant at the .05 level in both the analysis of covariance and the analysis of variance. The mean of the experimental group was the greater of the two means.

Tables 75, 76, and 77 summarize the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test D for Valley Junior High School, grade eight, pair two.

TABLE 75

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	496.85	496.85	26.10*
Deviation from regression	51	971.11	19.04	
Total	52	1467.96		

*Significance with $p < .01$

TABLE 76

REGRESSION ANALYSIS OF VARIANCE OF PRE AND POST-TEST SCORES ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS AT VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR TWO

Source of Variation	df	SS	MS	F
Attributable to regression	1	547.85	547.85	15.79*
Deviation from regression	52	1804.29	34.70	
Total	53	2352.14		

*Significance with $p < .01$

TABLE 77

ADJUSTED MEANS FOR POST-TESTS, VALLEY JUNIOR HIGH SCHOOL, GRADE EIGHT, PAIR TWO

Experimental group	Control group
34.65	28.78

F was found to be significant at the .05 level in both the analysis of covariance and the analysis of variance. The mean of the experimental group was the larger of the two means.

Tables 78, 79, and 80 summarize the analysis of covariance, analysis of variance, and adjusted means for pre and post-test scores on Test D for experimental and control groups, total research population, grades five, six, seven, and eight.

TABLE 78

REGRESSION ANALYSIS OF COVARIANCE OF PRE AND POST-TEST SCORES
ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS,
TOTAL RESEARCH POPULATION, GRADES
FIVE, SIX, SEVEN, AND EIGHT

Source of Variation	df	SS	MS	F
Attributable to regression	1	1810.37	1810.37	74.20*
Deviation from regression	336	8196.79	24.40	
Total	337	10007.16		

*Significance with $p < .01$

TABLE 79

REGRESSION ANALYSIS OF VARIANCE ON PRE AND POST-TEST SCORES
ON TEST D FOR EXPERIMENTAL AND CONTROL GROUPS,
TOTAL RESEARCH POPULATION, GRADES
FIVE, SIX, SEVEN, AND EIGHT

Source of Variation	df	SS	MS	F
Attributable to regression	1	2201.91	2201.91	43.88*
Deviation from regression	337	16911.96	50.18	
Total	338	19113.87		

*Significance with $p < .01$

TABLE 80

ADJUSTED MEANS FOR POST-TEST D, TOTAL RESEARCH POPULATION, GRADES FIVE, SIX, SEVEN, AND EIGHT

Experimental group	Control group
29.31	24.67

In all pairs, except the fifth and sixth grade group at Belmont School, and in the total population, significant differences were found between experimental and control groups at the .05 level when both analysis of covariance and analysis of variance were used. The null hypothesis is rejected with reservation. In the opinion of this writer, the results of test D alone do not constitute sufficient evidence of differences to reject the hypothesis without reservation.

An examination of the adjusted means reveals that the larger means were, in each case, those of the experimental groups.

Student Comments Regarding Electronic Music

Students in each of the seven experimental groups were asked to write, in a single paragraph, their opinions of electronic music. These opinions were judged to be positive if the comments were entirely favorable toward electronic music, and negative if the comments were strongly negative. If the comments were mixed or were neither strongly positive or negative, they were judged to be neutral. Some students chose not to comment at all. Table 81 shows the number of responses falling in each of these categories. (See Appendix C for specific student comments.)

An examination of the trend toward higher percentages of positive opinions at successively higher grade levels reveals that seventh and eight grade subjects reacted much more favorably (in terms of both positive opinions and willingness to commit themselves by expressing an opinion) than did fifth and sixth grade subjects. This appears to indicate some basis for determining the grade levels at which an electronic music-based curriculum might be most readily accepted by students.

TABLE 81

NUMBER AND PERCENTAGE OF STUDENTS IN EXPERIMENTAL GROUPS
WITH POSITIVE, NEGATIVE, OR NEUTRAL,
OPINIONS OF ELECTRONIC MUSIC

School and grade	N	Positive	Negative	Neutral	No Opinion
Belmont (grades 5,6)	20	7 (35.00%)	5 (25.00%)	3 (15.00%)	5 (25.00%)
Twining (grade 5)	24	1 (4.17%)	7 (29.17%)	2 (8.33%)	14 (58.33%)
Twining (grade 6)	23	5 (21.74%)	5 (21.74%)	2 (8.70%)	11 (47.82%)
Valley (grade 7, pair 1)	26	17 (65.38%)	4 (15.38%)	5 (19.24%)	0 (0.00%)
Valley (grade 7, pair 2)	25	12 (48.00%)	9 (36.00%)	0 (0.00%)	4 (16.00%)
Valley (grade 8, pair 1)	26	19 (73.08%)	4 (15.38%)	3 (11.54%)	0 (0.00%)
Valley (grade 8, pair 2)	27	20 (74.07%)	6 (22.22%)	0 (0.00%)	1 (3.70%)

CHAPTER V

SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to test a basic ungraded program of study in electronic music suitable for use in grades five through eight. Although current music textbook usage and the Music Educators' National Conference recommendations encourage teachers to use electronic music, no research findings were available to support the value of including electronic music or using it as a basis for the general music curriculum.

An investigation of the value of electronic music in the classroom was undertaken by testing these null hypotheses:

1. There are no significant differences between control and experimental groups in their attitudes toward music, as measured by the pre and post-tests.

2. There are no significant differences between control and experimental groups in the mastery of competencies in electronic music, as measured by post-tests.

3. There are no significant differences between control and experimental groups in the extent to which musical concepts have been

developed through exposure to and involvement with electronic music, as measured by post-tests.

The research population consisted of 339 students drawn from two elementary schools and one junior high school in the Grand Forks, North Dakota, Public Schools. These students were grouped into seven pairs of experimental and control groups. For one semester the experimental groups received music instruction using an electronic music-based curriculum while the control groups received more general, traditional music instruction. Measurements were made with a battery of four pre/post-tests to determine any possible significant differences, as stated in the null hypotheses of this study, between the experimental and control groups.

The statistical techniques utilized for this study were analysis of covariance and analysis of variance by regression. Analysis of variance was included to identify any effects that could be attributed to the covariate.

Summary of the Findings

Hypothesis One

No significant differences at the .05 level were found between the experimental and the control groups' attitudes toward music when tested with analysis of covariance. Using analysis of variance, differences existed at the .05 level for two of the seven pairs of groups. When the total population was tested as a whole with analysis of variance, no significant differences were found.

Hypothesis Two

Using analysis of covariance, significant differences at the .05 level in the mastery of competencies in electronic music were found between the experimental and control groups in each of the seven pairs. Analysis of variance revealed significant differences in all pairs but one. When the total population was treated as a unit with analysis of variance, significance was found at the .05 level.

Hypothesis Three

Using both analysis of covariance and analysis of variance, significant differences in the extent to which musical concepts have been developed through exposure to and involvement with electronic music were found at the .05 level between the experimental and control groups in all but one pair of groups, and for the total population, on one of two tests designed to measure these differences. The other test used to test this hypothesis did not possess sufficient reliability to make the data usable.

Students in each of the experimental groups were asked to write their opinions of electronic music. These student responses were judged to be more positive in grades seven and eight than in grades five and six. Specific comments were very explicit regarding the relevance of electronic music and the experimental project.

Discussion

Research studies dealing with electronic music in the classroom have been, heretofore, virtually non-existent. Although the single research study found (Prince, 1972) appears to be the first to investigate student response to electronic music, it does not attempt to evaluate learnings that can be developed through an electronic music-based curriculum. The conclusions of the present study indicate that there was a significant difference between the learnings of students in electronic music-based classes and those in more traditional settings. Although many of the learnings tested for in this study were indigenous to electronic music, it is possible for these learnings to become generalized musical concepts that are applicable to many other kinds of music.

Significant differences in attitude toward music were not found between the experimental and control groups at the conclusion of the experiment. This would seem to indicate that the use of electronic music is not detrimental to the development of a positive attitude toward music. In fact, the possibility exists that a significant contribution could appear, following an extended period of time, for those students who might be more highly motivated through an electronic music approach.

Because the entire concept of electronic music in the classroom provides relatively virgin territory for research, the findings of this study are only a beginning; many far-reaching implications are conceivable.

Conclusions

The following conclusions were drawn from the results of this study:

1. There were no significant differences between the control and experimental groups in attitude toward music.

2. In a majority of the groups tested, the experimental groups showed a significantly better mastery of competencies in electronic music than did the control groups.

3. Exposure to and involvement with electronic music contributed to a higher level of conceptual development for a majority of the experimental groups (for the portion of the musical concepts measured by Test D) than for the control groups.

4. Students' opinions of electronic music and their reactions to its inclusion in music class was much more positive in seventh and eighth grades than in fifth and sixth grades. There was a wide range of likes and dislikes; most students were able to tell quite specifically why they either liked or disliked electronic music. However, the comments seem to indicate that most students had not yet reached the point of being able to identify with the aesthetic aspects of electronic music.

5. An electronic music-based class should be considered, on an elective basis, as an alternative to the traditional general music class in grades seven and eight. An additional study could be made to determine the differences between the electronic music-based class and the traditional general music class when self-selection (choice between

electronic or traditional class) is made available to students.

Recommendations

The results of this study lead to the following recommendations:

1. Some electronic music should be introduced at each grade level with the main emphasis occurring at the seventh and eighth grades. Becoming familiar with terms and techniques appears to be one of the greatest obstacles for students. A gradual acquisition of necessary knowledge and skills could be much more easily developed if electronic music were started in the lower grades.

2. The development of musical concepts (through exposure to and involvement with electronic music) that are applicable to many kinds of music has not been conclusively established by this study. Further study should be undertaken to identify these concepts. The need for a reliable test instrument is crucial.

3. Electronic music's many sound capabilities lend themselves to unlimited development of the creative capacity. Additional studies should be made to uncover the potential of electronic music in relation to research findings in other phases of creativity.

4. Electronic music study should last for a period of time that will enable students to master the mechanical aspects well enough for the aesthetic aspect of the music to become the central focus of the learning experience.

5. An electronic music-based class should be considered, on an elective basis, as an alternative to the traditional general music class in grades seven and eight. An additional study could be made to determine the differences between the electronic music-based class and the traditional general music class when self-selection (choice between electronic or traditional class) is made available to students.

APPENDIX A

ELECTRONIC MUSIC-RELATED CONTENT MATERIAL

FOUND IN FIVE RECENT TEXTBOOK SERIES

Source and Material	Description	Page(s)
THIS IS MUSIC FOR TODAY (1971) Allyn and Bacon, Inc. Link Drive Rockleigh, New Jersey 07647		
THIS IS MUSIC FOR TODAY K		
None		
THIS IS MUSIC FOR TODAY 1		
None		
THIS IS MUSIC FOR TODAY 2		
Experiments with sound	basics of sound and tape recorder techniques	88-90
THIS IS MUSIC FOR TODAY 3		
The Science of Sound	vibration experiments	67
New Sound Experiences: Wachet Auf --J. S. Bach/Carlos	Moog description and example	68
THIS IS MUSIC FOR TODAY 4		
None		
THIS IS MUSIC FOR TODAY 5		
None		
THIS IS MUSIC FOR TODAY 6		
Electronic Music	tape techniques	64-65

Source and Material	Description	Page(s)
THIS IS MUSIC FOR TODAY 7		
New Instruments	synthesizers	152-153
THIS IS MUSIC FOR TODAY 8		
This Century in Transition	electronic music and scores	103-105
NEW DIMENSIONS IN MUSIC (1970-1972) American Book Company 300 Pike Street Cincinnati, Ohio 45202		
NEW DIMENSIONS IN MUSIC		
Dripsody --Hugh LeCaine	Musique concrète study of water dripping	191
Wind Song (Daphne of the Dunes) --Harry Partch	Unusual sounds and unusual instruments	191
NEW DIMENSIONS IN MUSIC 1		
Ensembles for Synthesizer #1 --Milton Babbitt	Electronic	130
NEW DIMENSIONS IN MUSIC 2		
Sound Montage --Edgard Varese --Ottorino Respighi --Leroy Anderson	Concrete and electronic sounds	17
Dance R 4-3 --Myron Schaeffer	Electronic	59
Banshee --Henry Cowell	Unconventional manner of playing the piano	173
NEW DIMENSIONS IN MUSIC 3		
Contrasts	Electronic	39

Source and Material	Description	Page(s)
NEW DIMENSIONS IN MUSIC 4		
Percussion Dances --Harry Partch	Unusual Instruments	158
Chorale Prelude --J. S. Bach	Electronic transcription	167
NEW DIMENSIONS IN MUSIC 5		
Music for Prepared Piano	Uses the "rast" scale	159
Ionization --Edgard Varese	Unusual instruments	205
Mobile	Unusual sounds	213
NEW DIMENSIONS IN MUSIC 6		
Aeolian Harp --Henry Cowell	Unconventional use of the piano	27
Gargoyles --Otto Luening	Violin and synthesizer	108
Dance --John Cage	Prepared piano	212
Sleepers Awake --J. S. Bach/Carlos	Moog electronic transcription	213
Events --Mel Powell	Voices and electronic	213
Of Wood and Brass --Vladimir Ussachevsky	Electronic, musique concrète treatment of wood and brass	213
NEW DIMENSIONS IN MUSIC 7		
Randu's Holiday --Gordon M. Uchenick	Chance music	36-37
Be a Performer	Piano, unconventional sounds	54-55
Axis --George Burt		

Source and Material	Description	Page(s)
Reconnaisance --Donald Erb	Electronic	87
Experiments		88
Canon --George Burt	Vocal sounds, unusual system of notation	198
Geod --Lukas Foss	Unconventional orchestra sounds	199
DISCOVERING MUSIC TOGETHER (Revised edition) Follett Publishing Company 1010 W. Washington Blvd. Chicago, Illinois 60607		
DISCOVERING MUSIC TOGETHER, EARLY CHILDHOOD		
Knocking Piece --Benjamin Johnson	Played inside the piano	152
DISCOVERING MUSIC TOGETHER 1		
None		
DISCOVERING MUSIC TOGETHER 2		
None		
DISCOVERING MUSIC TOGETHER 3		
None		
DISCOVERING MUSIC TOGETHER 4		
None		
DISCOVERING MUSIC TOGETHER 5		
None		
DISCOVERING MUSIC TOGETHER 6		
Ballet Mecanique --George Antheil	Uses airplane sounds	66

Source and Material	Description	Page(s)
DISCOVERING MUSIC TOGETHER 7		
Electronic and Experimental Music	Unit includes works by Cage and Babbitt	14-15
DISCOVERING MUSIC TOGETHER 8		
Electronic Music:	Electronic	180
Contrast #5 --Dick Raaijmakers		181
Electronic Music (You as a Composer)	Tape techniques	199
EXPLORING MUSIC (Revised edition) (1971) Holt, Rinehart and Winston, Inc. 383 Madison Avenue New York, New York 10017		
EXPLORING MUSIC K		
Upside Down	Children's choir with synthesizer accompaniment	91
The Little Man Who Wasn't There	Children's choir with synthesizer accompaniment	135
EXPLORING MUSIC 1		
Sonic Contours --Vladimir Ussachevsky	Electronic modification of conventional instrumental sounds	142
EXPLORING MUSIC 2		
Dance --John Cage	Prepared piano	147
EXPLORING MUSIC 3		
Banshee --Henry Cowell	Piano played in an unconventional way	156
EXPLORING MUSIC 4		

Source and Material	Description	Page(s)
Ionisation --Edgar Varese	Unconventional instruments	122
Bowery Bum --Ilhan Mimaroglu	Musique concrète study using a rubber band for a sound source	149
Forsythia --Mary Ellen Solt	Concrete poetry (could be used for original composition)	151
EXPLORING MUSIC 5		
Fragment --Bülent Arel	Electronic	12
No. 9 Zyklus for One Percussionist --Karlheinz Stockhausen	Percussion, unusual notation	13
Let's Explore Sounds	Unit on frequency, amplitude, etc.	188-189
EXPLORING MUSIC 6		
Explore the Materials of Music	Deals with raw sounds and composition	32-33
Listen to Electronic Music	Milton Babbitt explains tape manipulation	192
A Piece for Tape --Vladimir Ussachevsky	Combination of real and electronic sounds	192
Composition for Synthesizer --Milton Babbitt	Electronic	192
Three Synchronisms for Instruments and Electronic Sounds (#1 for Flute) --Mario Davidovsky	Flute and tape	193
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MAKING MUSIC YOUR OWN
(Revised edition) (1971)
Silver Burdett Company
Morristown, New Jersey 07960

MAKING MUSIC YOUR OWN K

None

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None

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APPENDIX B

ELECTRONIC MUSIC-BASED CURRICULUM

OBJECTIVES: ATTITUDES

At the end of the period of instruction the student should:

--find personal pleasure and satisfaction in his musical experiences.

--value music as a means of self-expression.

--desire to continue with further musical experiences.

--respond aesthetically to music as a result of his musical experiences and understandings.

--be able to make value judgments with respect to music and its expressive and aesthetic qualities.

--be aware of man's need for music in his life.

--have a positive outlook on the value of music as a creative and performing art.

--be able to verbalize his reasons for liking or disliking particular kinds and styles of music.

--rate music higher than before on a scale indicating preference for each subject the student is studying.

OBJECTIVES: COMPETENCIES

At the end of the period of instruction the student should be able to:

--operate a reel-to-reel tape recorder well enough to prepare musique concrète and electronic music tape recordings.

--make tape splices.

--make and use tape loops.

--transfer sounds directly from one recorder or sound source to another and to execute speed changes.

--operate simple electronic tone generators, reverberation units, filters, and to correctly patch them into an amplifier or tape recorder.

--produce sounds on conventional instruments in new ways.

--produce sounds on unconventional instruments.

--transform the character of conventional instruments.

--treat instrumental sounds electronically.

--treat industrial sounds and noises electronically.

--devise his own system or systems of notation which will serve as a plan for creating compositions.

--interpret various kinds of notational systems used by other composers.

--express himself through original music composition using his understandings of the elements of music as a basis for creating the composition. (See elements of music under OBJECTIVES: UNDERSTANDINGS.)

OBJECTIVES: UNDERSTANDINGS

At the end of the period of instruction the student should be able to:

--listen to music wiht a purpose as a direct result of his formation of concepts about the following elements of music and their interrelationships.

Timbre

Timbre is the tone color or quality of a given sound.
Expressiveness may be the result of timbral choice.
Like timbres are said to blend.
Unlike timbres provide contrast.
New (composite) timbres are formed when timbres are combined.
Timbres may be changed through modification of the harmonic structure.
Penetrating timbres achieve the best linear clarity when combined with more subdued timbres.

Pointillism may be used to provide interest within a given timbre.
Vibrato is a slight, recurring fluctuation in grequency (pitch).
Tremolo is the rapid interruption of a sound or timbre.
The timbre of conventional instruments is changed as the method of playing changes. (A good example of this is prepared piano.)

Dynamics

The degree of loudness or softness of a sound (volume or amplitude) will affect its expressive quality.
Different degrees of loudness and softness may be attained gradually or abruptly.
Dynamics may be used to shape a given phrase or musical thought by placing a climax (louder sound) in a strategic position.
The dynamics involved in the attack and decay (and the sustaining) of a sound comprise its sound envelope.
Sounds which are emphasized more than others are said to be accented.

Rhythm

Rhythm is the resulting effect produced when sounds and silences of similar or varying duration are combined.
The speed with which the music appears to move is called its tempo.
Rhythm may undergo augmentation when the durations of the component parts of a musical thought are proportionally compressed.
A gradual tempo increase is called an accelerando.
A gradual tempo decrease is called a ritardando.

Pitch

Sounds that can be identified and/or reproduced by another sound source have definite pitch.
Sounds that cannot be identified and/or reproduced by another sound source have indefinite pitch.
Pitch may be selected systematically or randomly.
A linear grouping of pitches is called a melody.
A horizontal grouping of pitches is called harmony.
Harmony is the result of the production of several (one or more) pitches simultaneously.
Chords, or sound clusters, may result from the simultaneous sounding of one or more pitches as a unit or as a result of their combination as independent musical thoughts.
Two or more melodies heard simultaneously create a kind of harmony known as polyphony.
Two or more pitches moving rhythmically together create monophony or chordal harmony.
One organizational system of combining pitches to create a melody is called a tone row.

--identify and describe the following terms.

amplifier
amplitude
attack
audio generator
audio oscillator
contact microphone
decay
envelope
erase head
feedback
filter
four-track recording
frequency
gain
half-track recording
harmonic
hertz
input
jack
magnetic tape
mixer
musique concrète
output
parameter
patch cord
plug
potentiometer
prepared piano
pulse wave
recording head
reverberation
ring modulator
sawtooth wave
signal generator
sine wave
sound-on-sound
sound-with-sound
source
splice
square wave
synthesizer
timbre
transistor
triangle wave
waveform
white noise

--relate electronic music to man's feelings and needs.

--describe, in simple terms, the scientific aspects of equipment and techniques used in electronic music.

--understand the importance of design in electronic music.

--understand the relationship between electronic music and other art forms.

--understand the place and role of electronic music in contemporary society (non-programmatic, programmatic, film music, cartoons, TV commercials, etc.).

APPENDIX C

STUDENT OPINIONS OF ELECTRONIC MUSIC

Students in each of the experimental groups were asked to "Write a short paragraph describing your opinion of electronic music." These opinions were judged to be positive if the comments were entirely favorable toward electronic music and negative if the comments were strongly negative. If the comments were mixed or were neither strongly positive or negative, they were judged to be neutral. Responses, presented exactly as written were as follows:

Key to symbols: +, positive opinion
-, negative opinion
0, mixture of positive and negative opinions
F, female
M, male
5,6,7, or 8 indicates grade level

I like it very much. It has interesting sounds. (+F,5)

I don't like it but I like it when we put those tapes together and played them on the tape recorder. (0,F,5)

I think it's O.K. (+,M,5)

I like electronic music. I think it is nice. (+,M,5)

I like it a bit. (0,M,5)

It's very fun and interesting. (+,M,5)

Well it was good and I enjoyed it very much. (+,M,5)

I like it because it has been fun and different. (+,F,5)

Well it is O.K., but I hate it. (-,M,5)

I don't like electronic music because I don't think it's interesting. (-,F,6)

I like it. (+,F,6)

I think that electronic music is fun, sometimes O.K., but sometimes it was boring. (0,F,6)

It was fun to listen to but I did not like it. (-,M,6)

I do not like it. (-,M,6)

I dislike it very much because I don't like music like that. I like the music with people singing. (-,M,6)

I like it a bit. (0,M,6)

I think it is interesting and has a lot of interesting sounds in it. (+,M,6)

Well it wasn't bad. It was pretty good. I kind of had a little fun doing it, I liked the Moog out at the UND. It was fun. They made thunder sounds and train sounds and storms and the tape recorder is fun talking to. I like its echo. (+,F,6)

Electronic music is sorta fun. Some of it was fun, but some wasn't. (0,F,6)

It is sorta fun. I liked some of the compositions. Some I disliked a lot. (0,F,6)

I think it is hard but interesting. I like the sounds that it makes. I liked the splicing the tapes. Thank you for this opportunity. (+,F,5)

It's fun doing the things but it's too hard to understand. (0,F,5)

I liked listening to it, but I don't care to learn about it. I don't like taking these tests. I don't think that a lot of kids loved it. I think it was fun. I didn't know how to operate a tape recorder until I had this electronic music. I really thought it was fun making tape loops. I really enjoyed it. Thank you for giving me electronic music. (0,F,5)

It's O.K. but I like a normal music class. (0,F,5)

I dislike it but I like it too. (0,F,5)

I like it a little. (0,F,5)

I like it a little. (O,F,5)

A little terrible and a little good. (O,M,5)

Terrible! (-,M,5)

Just a little good. (O,M,5)

I really am bored. (-,M,5)

Very neat and is good for making movies. (+,M,5)

It's not bad. But I hate it. (O,F,5)

I like it better than regular music. It is funnier, and I like it because it is faster than rock music. (+,F,6)

I like it, but it is boring taking the test before and after you are done and it is very good stuff. (O,F,6)

I really enjoyed it. (+,F,6)

I think electronic music is OK. I would not like it a lot. Maybe 1 time a week. (O,F,6)

It is very interesting to hear the different noises. I like it. (+,F,6)

It was pretty fun when we worked on tapes and other things, but other times it was boring. (O,M,6)

I like the music made by it, but it's kind of hard to understand. (O,F,6)

I think it's OK. It lets you dream and think of other things. Imagination. (+,F,6)

I hate it because of the fact it's boring. (-,F,6)

I like it very much. (+,M,6)

It's fun when you use the recorder. Otherwise, it's a waste of time. (O,F,6)

It's boring because you don't learn anything fun. You just learn junk from paper. The papers are not fun. (-,M,6)

I liked it a lot more than singing or anything but at times it was boring and seemed to take so long to get through with it. (O,M,7)

I think electronic music is interesting and fun to study. The best part I liked was listening to recordings of electronic music, and making our own recordings. I liked going to see the Moog synthesizer, too. To me, electronic music is fun. (+,F,7)

I don't really like electronic music because it's too complicated for me and I don't understand most of it. (-,F,7)

I liked it because we got to use the tape recorder and got to splice and got to make a tape loop. That's shy I like it. (+,M,7)

The part I liked was the experiments when you patch up the generator, audio generator, amplifier and so on. I also liked it when we were making tape loops. (+,M,7)

I liked learning about electronic music. I like it because of the way it sounds. It's a really interesting sound. (+,F,7)

I think electronic music is interesting but when we had to listen to the tapes it was boring with some of the songs. So I think that they (whoever made it) should have made it a little more interesting in the packets. (0,F,7)

I like electronic music. It is very interesting to listen to. I hope Valley has a electronic unit next year too. I learned a lot of things that I didn't know before. (+,M,7)

I liked electronic music because it was interesting to me because I never knew how or what electronic music was. (+,M,7)

I don't like it on some songs, but on others I think it could sound good. (0,F,7)

I didn't like electronic music because they use perfectly nice songs and classic music and make them sound funny stupid. I also didn't think it was fair that we had to study on it for nine weeks and then have to take a final test without any review. (-,F,7)

I liked electronic music because it does a better job of expressing the way I feel and think, than conventional instruments would do. (+,M,7)

I don't know that much about it because I was at lessons most of the time but electronic music isn't music to me. I don't know why. I didn't like the things or experiment we had to do. It didn't seem like music to me. (-,F,7)

I like the electronic music unit because I thought it was very interesting. When we went to see the Moog, it was very interesting. (+,F,7)

Electronic music is very difficult subject to learn. I liked electronic music because the experiments were fun. The reading I did not understand very well. But otherwise it was interesting. (+,M,7)

I liked studying it, and it makes music much easier than it used to be before. Because it's simpler to explain. (+,M,7)

I like electronic music because it comes from one machine (so to speak) but you don't have to use guitars or those instruments, just patch cords and the Moog synthesizer. (+,F,7)

It was interesting to learn you could make these different kinds of sound in electronic music and I think it was the best section of music. (+,M,7)

I don't like electronic music. (-,F,7)

I liked it because I think it is fun. And I like to listen to music and I like to splice tapes. I think electronic music is fun. (+,M,7)

I like the sort of music electronic music makes but I don't quite understand how it was made. It was kind of hard to remember all the meanings of the words and what they did. The part I liked was just listening to the sounds of the Moog. (+,F,7)

Electronic music was fun but I don't think it had that much to do with music. (0,F,7)

I think electronic music was a very interesting unit. I enjoyed going and seeing the Moog and hearing all the different sounds it makes. I would like to learn more about electronic music. (+,F,7)

It sounds good, but it seems too hard to operate without a lot of training and practice. The tape recorder is fairly easy to operate. (+,M,7)

I liked electronic music. I learned a lot of new things. It was very interesting. (+,M,7)

I think it was a good thing but should not teach it during school. But they should make a special class. (-,M,7)

It was neat. I didn't know we even had electronic music. (+,M,7)

I kind of like it a little. I liked splicing the tape. (+,F,7)

I really liked electronic music. I found it interesting working with and listening to the wierd and funny sounds. (+,F,7)

It is alright, but sometimes I can't understand it. It makes neat sounds. (+,M,7)

I like it when we splice the white noise. When we ran the triangle wave, sine wave, square wave, sawtooth wave, pulse wave, white noise. (+,M,7)

I liked parts and didn't like parts. I didn't like when we had to learn the words, all the rest was fun. (O,F,7)

Some of it's fun to listen to and makes sense. Other electronic music just sounds like a bunch of noise. I like splicing. (O,F,7)

Electronic music was fun. In way like when we use the tape recorder and all those little black boxes. (+,M,7)

I think it is very good. But there are too many dumb songs made from the dumb things like the Bowery Bum. I like the songs like Hey Jude, Spinning Wheel and What's New Pussy Cat played on the synthesizer. (O,M,7)

I liked listening to the music but I didn't like learning the terms. Overall it was o.k. (O,M,7)

I liked working with the tape recorders, but I didn't like learning all the different definitions and what they meant. (O,F,7)

I liked electronics music because we didn't have study music notes. Electronic music sounds pretty good when you get used to it. (+,M,7)

I liked the synthesizer. I liked electronic music. Mostly the tape. (+,F,7)

I liked the electronic music because of the experiments and the things the computers made, that I didn't know. I had fun learning what you can make and do with music. I also like learning some things about music I never knew before. Some of the music I really liked and some I didn't like the sounds. (+,F,7)

Some of it I like. But I don't like a bunch of goofy noises. (O,M,7)

It's alright but I don't think I hear it very often. I enjoyed splicing tapes and making tape loops. (+,F,7)

I liked electronic music a little, but I don't think half of us will ever use it. We might someday. I liked using the different devices the best. (O,F,7)

Electronic music is O.K. But it is not as good as everyday music. (O,M,7)

I liked electronic music. I liked the sounds it made in some of the songs we played like whats New Pussycat. I also liked the siren. (+,F,7)

The sounds were very interesting. I suppose it was fun. (+,F,7)

Sometimes I like it a lot, but sometimes it's really boring. I didn't like when we were reading those packets and they had all the words we didn't know. I kind of like the songs that we played. Especially the Space Oddyssey one. (O,F,7)

I liked electronic music because I like to splice things and do things with tapes, but I'd rather work with the tape recorders more and learn the words when we're doing it. (+,F,8)

I like it because it's new and it was fun learning about different devices, and it can still have music that expresses your feelings. (+,F,8)

I think it was a good way to learn how sounds are made and how to learn to use a tape recorder. (+,F,8)

I felt electronic music was interesting because it gives a person a chance to change an old song into something that he feels is better. It lets the person experiment with any instrument, and lets him see the many ways one instrument can be changed. (+,M,8)

I have enjoyed hearing electronic music very much. It is different and somehow more alive than if it were played on a conventional instrument. (+,F,8)

I like it maybe because my Dad works in a radio station and I know some of the technical stuff. I think the music is interesting too, because of some of the sounds. (+,M,8)

I liked electronic music because it was something different. I've never had it before and it was pretty interesting to hear all the songs being played electronically. I think it was a fun unit. (+,F,8)

I don't like it as much as rock music. I like some kinds of electronic music though. I don't like when they just pick a bunch of sounds and play them. I like it better when it has a pattern and a melody. (O,M,8)

I don't especially care for electronic music because I don't quite understand it. (-,F,8)

I like it because it is different and you don't know what's making the sounds which also makes it more interesting. (+,M,8)

I think electronic music is really interesting. I enjoy music that is different. (+,F,8)

I liked it because of the different sound it made. The way the songs were played. One song I liked was Spinning Wheel. (+,M,8)

I like electronic music because it has a different sound to it and because I didn't hear it. You like it more than you do when you hear it the first time. (+,M,8)

Most of the songs that were played were good but some were pretty bad. I liked the experiments and I like electronic music overall, or in general, but modern music is better. (O,M,8)

I don't really like it because I don't see why we have to learn about a tape recorder for. (-,F,8)

Electronic music is interesting when the use is many different sounds, like indefinite pitch, and exciting. (+,M,8)

There are parts that are good and some that are not. I like it because it is a new kind of music, it is pleasant to hear. Most pieces are good. I don't like the chance part because that takes no real talent, just push some buttons, pull a lever and that's its. (O,M,8)

I really didn't like electronic music but some parts of it was fun. I think if they didn't have so many pamphlets, it would have been better. (-,F,8)

I liked electronic music because it was different than what we did before. (+,F,8)

I think it was O.K. but it could be better by doing all the projects. I think it would be nicer if you'd take the class as a whole to see the synthesizer during class one day. It was something that was like review for me except for the terms. I liked it a lot when I was at the recorder. (+,M,8)

I thought it was alright because I learned how to use the tape recorder better, and electronic music better. (+,M,8)

I think electronic music is great music because I like it. I wish they had records of electronic music. (+,F,8)

I like electronic music, but I just don't like having to learn all these terms because most of us will forget them in the summer. I like electronic music because it has different sounds that can make different kinds of songs. (O,M,8)

My opinion on electronic music is that it is very interesting because of all the different sounds and musics that can be produced on such simple instruments. (+,M,8)

I liked it better than what we do in regular music class because it's more interesting and I like electronic music. (+,F,8)

I liked it a lot I guess because I liked all the sounds it make and I liked the way it sorta changed a song you knew well into something more interesting to listen to. (+,F,8)

This music was OK. I didn't like it much because it has no meaning at least to my opinion. Maybe if I were here longer I would like it. (O,M,8)

Let's say that I like some electronic music. I don't like it when the piece of music doesn't have any melody. I do like it when it's a song with a melody and an interesting background. I used to have a reel tape recorder but I didn't like it, 'cause there was nothing to do with it. So I gave it away and got a casette recorded. Now I wish I would have kept it. (O,F,8)

Electronic music is pretty good to listen to and is pretty fun to do the experiments in the packets and work with the tape recorder. The terms are a little confusing but other than that I think electronic music is all right. (+,M,8)

Some of it was fun and interesting. A few of the songs weren't very good but most of them were OK. It was a lot better studying electronic music instead of regular music and I think you should do it next year. (+,F,8)

I thought it was fun to do because you work with music that is old and new and I think everyone likes to learn about the music that is being played now, not old fashion music. (+,F,8)

I liked the songs that were played in electronic music but I didn't like the unit itself because it was kind of boring. But I did learn a little bit about the tape recorder and how to run it. (O,F,8)

It was OK, it was not too hard. (+,M,8)

Electronic music is pretty good for a change from regular music. It sounds very nice when there are new and interesting sounds in an electronic music composition. But some compositions in electronic music get to be pretty boring. (O,M,8)

Electronic music has a neat form over all other kinds of music. It has interesting sounds that make you want to listen. Some don't have anything good but most of it does and I like it a lot. (+,M,8)

It's interesting. Some of it's good and some bad. I liked working with it. (+,M,8)

I think it was fun because it was different and interesting. (+,M,8)

Electronic music is becoming as popular as rock and roll. I liked the unit very much and I thought it was fun making new sounds and different sounds. You should have this unit again next year but only with more sections. (+,F,8)

I think electronic music is pretty cool when they take conventional music (rock) and play it electronically. It sounds better. In Part C the best songs were Spanish Eyes, and Spinning Wheel. I think some of the pure electronic songs are pretty good also like Contrast No. 5. (+,M,8)

I think electronic music is interesting. I learned a lot about it. This unit was the most interesting and funest of all we did in music. I think you should do it next year. (+,F,8)

I thought electronic music was very interesting and different. It was fun to listen to. (+,F,8)

I find electronic music very fascinating and if I had any ability with music at all I would work with electronic music. (+,F,8)

I liked electronic music a lot. It had a lot of different sounds in it. It was fun to make up your own songs and tunes. Yes, I really enjoyed this. (+,F,8)

I liked electronic music because it's something new for a change. (+,M,8)

My opinion is kind of confusing. Some parts of it I liked and other parts I didn't. Some of the parts were really boring. I can't say too much about the first three packets because I was not here. I think you should continue this next year. I really thought that most of this unit was interesting. (O,F,8)

I like electronic music. It expresses some feelings that other music can't. It involves new and interesting sounds, but I still like the music I listen to on the radio better. (O,F,8)

I thought that electronic music was very interesting to study. I would like to know more about all the things that produce the electronic sounds-such as the generators and oscillators and all that. I wish we could have had more time to make our own tapes and experiments. (+,F,8)

I liked electronic music a lot. I studied it a little bit last year but not that much. I think I learned a lot more last year. I liked most of what I learned. (+,F,8)

I think that electronic music is good. It has different sounds. (+,M,8)

I like it a little but I hate to run into it somewhere else in life. It was fun in some parts. (O,M,8)

I like some of the sounds of it but I wouldn't like to hear that much. (O,M,8)

APPENDIX D

ELECTRONIC MUSIC STUDY

Pre/Post Test

Test A

Directions: Choose the answer that best describe your feelings about each of thes statements below. Circle the letter in front of that answer.

1. Music is enjoyable.
   a. strongly agree
   b. agree
   c. no opinion
   d. disagree
   e. strongly disagree

2. Music helps me express the way I feel.
   a. strongly agree
   b. agree
   c. no opinion
   d. disagree
   e. strongly disagree

3. I like music at home.
   a. strongly agree
   b. agree
   c. no opinion
   d. disagree
   e. strongly disagree

4. The more I learn about music, the more I enjoy it.
   a. strongly agree
   b. agree
   c. no opinion
   d. disagree
   e. strongly disagree

5. Beautiful music is music that has interesting things happening in it.
   a. strongly agree
   b. agree
   c. no opinion
   d. disagree
   e. strongly disagree

6. I can tell someone else why I like or don't like different kinds of music.
   a. strongly agree
   b. agree
   c. no opinion
   d. disagree
   e. strongly disagree

7. Playing, singing, or writing music is a good way for people to "do their own thing."
   a. strongly agree
   b. agree
   c. no opinion
   d. disagree
   e. strongly disagree

8. I like music better when I don't know very much about it.
   a. strongly agree
   b. agree
   c. no opinion
   d. disagree
   e. strongly disagree

9. Not everyone needs music.
   a. strongly agree
   b. agree
   c. no opinion
   d. disagree
   e. strongly disagree

10. Playing, singing, or writing music is a good way to use your imagination.
   a. strongly agree
   b. agree
   c. no opinion
   d. disagree
   e. strongly disagree

11. I like some kinds of music better than others, but I don't know why.
    a. strongly agree
    b. agree
    c. no opinion
    d. disagree
    e. strongly disagree

12. I don't like music.
    a. strongly agree
    b. agree
    c. no opinion
    d. disagree
    e. strongly disagree

13. Some kind of music is good for everyone.
    a. strongly agree
    b. agree
    c. no opinion
    d. disagree
    e. strongly disagree

14. I like music well enough to use it when I'm not at school.
    a. strongly agree
    b. agree
    c. no opinion
    d. disagree
    e. strongly disagree

15. Music without interesting sounds is boring and unpleasant.
    a. strongly agree
    b. agree
    c. no opinion
    d. disagree
    e. strongly disagree

16. Music does not help me express the way I feel.
    a. strongly agree
    b. agree
    c. no opinion
    d. disagree
    e. strongly disagree

17. List each of the subjects you take in school below and rate them according to how well you like them.

<u>social studies</u>
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

<u>English</u>
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

<u>math (arithmetic)</u>
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

<u>physical education</u>
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

<u>music</u>
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

<u>science</u>
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

<u>reading</u>
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

art
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

shop
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

home economics
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

____
a. like very much
b. like
c. no opinion
d. dislike
e. dislike very much

18. Rate the subjects you are now studying in school in the order you like them best.

______physical education	______home economics	1. 1st choice
		2. 2nd choice
______science	____________________	3. 3rd choice
		4. 4th choice
______art		5. 5th choice
		6. 6th choice
______social studies		7. 7th choice
		8. 8th choice
______music		9. 9th choice
		10. 10th choice
______English		
______math (arithmetic)		
______reading		
______shop		

ELECTRONIC MUSIC STUDY

Pre/Post Test

Test B

Directions: Check each of the competencies that you feel you have mastered. Total the number of check marks and indicate on the rating scale the total number of competencies for each item in the lists below.

The rating scale may be interpreted as follows:

1	2	3	4	5
/	/	/	/	/

needs additional instruction and/or practice — average — competent

AT THE END OF THE PERIOD OF INSTRUCTION THE STUDENT SHOULD BE ABLE TO:

1. operate a reel-to-reel tape recorder well enough to prepare musique concrete and electronic music tape recordings.

Student is able to:

__connect machine to power source and turn on.
__thread machine correctly.
__operate in playback mode.
__connect microphone or other device to input and turn off monitor when using microphone.
__adjust proper recording level.

1	2	3	4	5
/	/	/	/	/

2. make tape splices.

Student makes splices that conform to these specifications:

__Both ends to be spliced have been cut at the same angle. (60^{o})
__Ends are butted together with no overlap or space showing.
__Splicing tape is affixed to shiny, uncoated side of the joint.
__Tape is pressed firmly in place so no air bubbles show.
__No excess splicing tape protrudes beyond the sides of the recording tape.

1	2	3	4	5
/	/	/	/	/

3. make and use tape loops.

Student is able to:

__determine exact spots where loop ends should be cut and mark these spots with a grease pencil.
__determine direction of travel for tape loop and mark with a grease pencil.
__join ends of tape to make a twist-free loop.
__keep loop passing over playback head properly (not twisted or wrapped around the capstan).
__manipulate loops with hand to produce pitch and tempo change effects.

1	2	3	4	5
/	/	/	/	/

4. transfer sound directly from one tape recorder to another and execute speed changes.

Student has demonstrated his ability to:

__patch the output of one recorder to the input of another recorder.
__choose playback mode for the first machine and record mode for the second machine.
__operate monitor switch and set playback volume of first machine and record level of second machine to get a good quality recording on the second recorder.
__set speed controls of each machine on speeds that will either make the original sounds faster or slower on the second tape.

__make multiple dubs to increase or decrease the original speed by at least four times.

1	2	3	4	5
/	/	/	/	/

5. operate simple electronic tone generators and controllers, reverberation units and filters and correctly patch them into an amplifier or tape recorder.

The student is able to produce an appropriate electronic tone by connecting:

__a tone generator into an amplifier and exhibiting internal frequency control.
__a tone generator into an amplifier and an external frequency control into the generator and exhibiting external frequency control.
__a tone generator into a reverberation unit and the reverberation unit into the amplifier.
__a tone generator into a filter and the filter into an amplifier.
__each of the above into a tape recorder, and monitor the sound while recording.

1	2	3	4	5
/	/	/	/	/

6. produce sounds on conventional instruments in new ways.

Indicate below the number of new sounds produced that differ from each other in pitch or timbre.

1	2	3	4	5 or more
/	/	/	/	/

7. produce sounds on unconventional instruments.

Indicate below the number of different sounds that the student can produce on a "non-instrument."

1	2	3	4	5 or more
/	/	/	/	/

8. transform the characteristics of conventional instruments.

Indicate below the number of transformations the student is able to produce (preparing instruments).

1	2	3	4	5 or more
/	/	/	/	/

9. treat instrumental sounds electronically.

Indicate the number of electronic treatments the student is able to make from an original instrumental sound.

1	2	3	4	5 or more

10. treat sounds and noises electronically.

Indicate number of electronic treatments student is able to make from original sound or noise.

1	2	3	4	5 or more
/	/	/	/	/

11. devise his own system or systems of notation which will serve as a plan for creating compositions.

Student is able to devise notation for

__pitch and harmony
__duration
__timbre
__dynamics and tempo
__form

1	2	3	4	5
/	/	/	/	/

12. Interpret various kinds of notational systems used by other composers.

Student is able to follow and accurately describe sounds shown in another composer's score as he hears the composition or he is able to reproduce the composition (in performance) from the score.

__pitch and harmony
__duration
__timbre
__dynamics and tempo
__form

1	2	3	4	5
/	/	/	/	/

13. express himself through original music composition using his understandings of the elements of music as a basis for creating the composition.

Upon listening to the student composition, the teacher will find evidence of the following concepts being applied.

__timbre
use of (contrasting) timbres that are appropriate to the character of the composition

__dynamics
use of variety (either gradual or terraced) of volume levels

__harmony
the presence of multiple sounds

__rhythm
use of varied tone durations, and the use of both like and unlike rhythmic patterns or sequences

__pitch
use of varied pitches (definite or indefinite) grouped together in a meaningful sequence and like or unlike melodic patterns, phrases, and sections within the composition

1	2	3	4	5
/	/	/	/	/

ELECTRONIC MUSIC STUDY

Pre/Post Test

Test C

Directions: Choose the best answer to describe what you hear in each of the recordings. Read the title at the beginning of each set of questions before you answer the questions.

ESPANA--Chabrier

1. The pitches in this piece were probably
   a. randomly selected (just happened).
   b. systematically selected (were carefully chosen).

2. The composition makes use of
   a. definite pitches (pitched sounds).
   b. indefinite pitches (unpitched sounds).

ESPANA--Chabrier

3. The music has
   a. only melody.
   b. melody and harmony.

4. The music has
   a. melody.
   b. no melody at all.

ESPANA--Chabrier

5. Was pointillism used (pointillism is used when the tone color changes often)?
   a. yes.
   b. no.

6. The timbres (tone colors) used are
   a. all alike.
   b. contrasting (different).

ESPANA--Chabrier

7. The dynamic changes (lound and soft) are mostly
   a. abrupt (sudden).
   b. gradual.

8. Were accents used in this composition (accented notes are those played louder than the rest)?
   a. yes.
   b. no.

PRELUDE IX--Mimaroglu

9. The pitches heard were probably
   a. randomly selected (just happened).
   b. systematically selected (were carefully chosen).

10. The piece makes use of
    a. definite pitches (pitched sounds).
    b. indefinite pitches (unpitched sounds).

PRELUDE XI--Mimaroglu

11. The timbres (tone colors) used in this composition were made
    a. by the same object with the sound modified (changed).
    b. by several different objects.

12. Is there a definite rhythm made of sounds and silences in this composition?
    a. yes.
    b. no.

GOOD NIGHT--German Folk Song (Moog)

13. Are there at least two like timbres (tone colors) that blend together in this composition?
    a. yes.
    b. no.

14. Does the choice of timbre (tone color) seem to make the song expressive?
    a. yes.
    b. no.

15. The harmony is the result of
    a. chords.
    b. melodies.
    c. chords and melodies.

AEOLIAN HARP--Henry Cowell

16. The changes in timbre (tone color) in this piece are made by
    a. different instruments.
    b. playing the same instrument in different ways.

17. The dynamic changes (loud and soft) were mostly
    a. gradual.
    b. abrupt (sudden).

CONTRAST #5--Raaijmakers

18. Contrasts (differences) are heard in
    a. timbre (tone color).
    b. dynamics (loud and soft).
    c. both timbre and dynamics.

19. Does the piece have an accelerando (gradually gets faster)?
    a. yes.
    b. no.

SPANISH EYES--Kaempfert

20. An ostinato (repeated) pattern is easily heard in this song because the ostinato's timbre (tone color)
    a. blends well with the other timbres used.
    b. is penetrating (sticks out) and contrasts with the other timbres used.

WHAT'S NEW PUSSYCAT--Bacharach

21. Was the choice of timbres (tone colors) especially suitable for this song?
    a. no.
    b. yes.

SONIC CONTOURS--Ussachevsky

22. The rapidly changing sound heard in this composition is a good example of
    a. vibrato.
    b. tremolo.

SERENADE--Schoenberg

23. The melody you hear is
    a. random (just happens).
    b. serial (chosen in a certain order).

NONESUCH GUIDE (example)--Beaver and Krause

24. The rapidly changing sound heard in this composition is a good example of
    a. vibrato.
    b. tremolo.

SPINNING WHEEL--Thomas

25. The melody in this composition is repeated many times. Is it ever augmented (stretched out, made slower)?
    a. yes.
    b. no.

26. Which of the following does this composition include?
    a. accelerando (gradually getting faster).
    b. ritardando (gradually slowing down).
    c. accelerando and ritardando.
    d. neither accelerando or ritardando.

ELECTRONIC MUSIC STUDY

Pre/Post-Test

Test D

Directions: Choose the correct definition for each term given below. Place the letter that corresponds to the definition in the blank at the left of the term. You may not need to use all of the definitions in the right-hand column.

___ 1. amplifier

___ 2. amplitude

___ 3. attack

___ 4. audio generator

___ 5. audio oscillator

___ 6. contact microphone

___ 7. decay

___ 8. envelope

___ 9. erase head

___10. feedback

a. device in a tape recorder that erases something that was recorded before

b. the ending of a sound or signal

c. the beginning of a sound or signal

d. an electronic device that produces complex signals (waves) other than sine waves

e. the loudness (maximum strength) of a wave

f. a device used to increase the strength of a signal

g. a microphone that is placed in direct contact with a vibrating object to change those vibrations into electrical signals

h. a microphone that permits only selected frequencies to pass through it at full amplitude

i. amplitude characteristics that determine the attack, sustain level, and decay rate of a sound or signal

j. the feeding of an output signal back into a tape recorder to produce an echo effect

k. an electronic device that produces fundamental signals or sine waves (no harmonics)

__ 1. filter

__ 2. four-track recording

__ 3. frequency

__ 4. gain

__ 5. half-track recording

__ 6. harmonic

__ 7. hertz

__ 8. input

__ 9. jack

__10. magnetic tape

a. plastic tape coated with particles of iron oxide (This tape is used to make recordings.)

b. term used to mean number of cycles (vibrations) per second

c. an overtone or frequency present (in addition to the fundamental) in complex sounds or waves

d. the number of vibrations per second (these vibrations usually determine pitch)

e. a device that permits only selected frequencies to pass through it at full amplitude

f. a recording that uses four separate sound paths on the tape at one time

g. a signal fed into a circuit or device

h. a socket into which electrical connections may be made by inserting the plug of a patch cord

i. a device used to increase the strength of a signal

j. a recording that uses two separate sound paths (each half the width of the tape) on the tape at one time

k. the amount or degree of amplification of an electronic device

__ 1. mixer

__ 2. musique concrète

__ 3. output

__ 4. parameter

__ 5. patch cord

__ 6. plug

__ 7. potentiometer

__ 8. prepared piano

__ 9. pulse wave

__10. recording head

a. a cord with a plug at each end used to connect devices (It is plugged into jacks located on the devices.)

b. a piano that is changed in sound by preparing it (attaching rubber, felt, wooden, or metal objects to the strings)

c. plastic tape coated with particles of iron oxide (This tape is used to make recordings.)

d. a measurable quantity, a variable characteristic of a signal or sound

e. the signal that comes out of a circuit or device

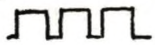
f. a device for combining or mixing several signals together

g. music composed from real sounds (non-electronic) and processed with a tape recorder

h. a connector that establishes electrical connection when inserted into a suitable jack

i. a variable resistor often used as a volume or frequency control

j. a fundamental wave and varying degrees of various harmonics that depend upon the width or duty cycle of the wave



k. a device in a tape recorder that arranges the particles of iron oxide on the tape into a pattern corresponding to the input signal

__ 1. reverberation

__ 2. ring-modulator

__ 3. sawtooth wave

__ 4. signal generator

__ 5. sine wave

__ 6. sound-on-sound

__ 7. sound-with-sound

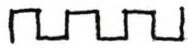
__ 8. source

__ 9. splice

__10. square wave

a. sounds recorded on separate tracks or paths on the tape, but played back together at the same time

b. a signal made up of a fundamental and all odd-numbered harmonics



c. the device supplying or producing sounds or signals

d. the connection or joining of two separate pieces of magnetic tape, this joint is usually made with the help of a special kind of tape

e. a set or group of electronic instruments for the production and control of sound

f. repeated sounds heard after the original sound

g. the source of a sound or signal

h. a signal consisting of a fundamental frequency and all harmonics

i. a method of recording a sound directly on top of a previously recorded sound (The erase head of a recorder must be disconnected or covered.)

j. a fundamental frequency (has no harmonics)

k. a device which accepts two input signals (The resulting output is two new signals: one is equal to the sum of the two input signals, and the other is equal to the difference of the two input signals.)

__ 1. synthesizer

__ 2. timbre

__ 3. transistor

__ 4. triangle wave

__ 5. waveform

__ 6. white noise

a. the tone color or quality of a sound (It is dependent upon the harmonic structure of a signal or a sound.)

b. a signal containing no even harmonics 

c. a signal consisting of a fundamental frequency and all harmonics 

d. an electronic (semi-conductor) device used in amplification and oscillation

e. the graphical shape of an electronic signal, usually represents amplitude vs. time

f. a signal which contains all audible frequencies (It sounds somewhat like escaping steam.)

g. the loudness (maximum strength) of a wave

h. a fundamental frequency (has no harmonics)

i. the source of a sound or signal

j. a signal fed into a circuit or device

k. a set or group of electronic instruments for the production and control of sound

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Write a short paragraph describing your opinion of electronic music.

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